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The changes that are of interest to readers of this report are as follows:

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SCIENCE & TECHNOLOGY

EUROPE & LATIN AMERICA

CONTENTS

FRG FIRMS BEGIN MICROGRAVITY RESEARCH ON HEAT-RESISTANT MATERIALS

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 451, 16 Mar 87 pp 13-14

[Text] The MAN, MTU, Thyssen, and Krupp companies and the Institute for Materials Casting of the Rhine Westphalia Technical University in Aachen have begun a joint project called OSIRIS to develop technologies for optimization of materials by exploiting microgravity conditions. The abbreviation OSIRIS stands for "Oxide Dispersed Single Crystals Improved by Resolidification in Space." The project's goal is to investigate industrial application possibilities of microgravity in connection with optimization of material properties of components. Turbine blades used in aircraft engines are an example of such application oriented components.

For the time being, the duration of the project has been set at 3 years. BMFT [Federal Ministry for Research and Technology] subsidies amount to DM5.4 million for the first phase.

The joint project covers problem areas already being investigated in a series of individual experiments in earth laboratories and even aboard SPACELAB. Over the long term the project will link these areas to form a common, technically useful project. In detail, the following objectives are to be pursued:

--a stable suspension of oxide particles in a molten bath (in conditions of microgravity no buoyancy, no sedimentation).

--interaction of particles with gradual solidification front (in conditions of microgravity [as published], either too rapid buoyancy, or else sedimentation);

--regulated, single crystal solidification of superalloys (in conditions of microgravity no disruptive convection).

--regulated resolidification of molds of complex shapes (in conditions of microgravity, lack of metal static pressure; therefore, thin ceramic supportive coverings only a few millimeters thick are sufficient as a mold).

--influence of the condensation of molten metal on the supportive covering (in conditions of microgravity, molten metal can be resolidified without a container and therefore heterogeneous nucleation based on the mold can be avoided, which is important for single crystal resolidification).

In addition to dealing with scientific and technological questions, the project should provide the basis for an assessment concerning utilization and longer-term application of research findings.

In this context, the example of turbine blades is particularly interesting. Turbine blades are highly technical components of great scientific importance because they are used for the production of energy in stationary and non-stationary turbines.

With regard to alloy development on earth, the turbine blade is one of the applications in which the need to increase heat resistance always leads to high costs. Existing superalloys represent the ultimate in current technological opportunities in view of the level of complexity achieved in the selection of properties. Consequently, the price is extremely high, and today it is around a few thousand DM for a blade weighing approximately 100 grams. Therefore, the quantity of blades necessary for the production and repair of aircraft turbines is such that production in space would appear to be economically viable even if only modest improvements were achieved. The expected improvement in quality of the production of single crystal, dispersion reinforced blades in conditions of microgravity cannot yet be assessed. However, if it were possible to achieve an increase of 50-100 degrees Celsius in the permissible material temperature, production in space could well be worthwhile.

8701/12955
CSO: 3698/M222

ULTRATHIN FILM R&D AT NEW MAX PLANCK POLYMER INSTITUTE

Stuttgart BILD DER WISSENSCHAFT in German Mar 87 pp 102-113

[Article by Christine Broll: "For Intelligent Plastics"]

[Excerpts] The chemical industry regards high-tech plastics as an important market. But the industry is still lacking basic information for their purposeful development. At the Max Planck Institute in Mainz for Polymer Research, these foundations are being worked out. Collaboration with corporations is close--are they too close for an institute funded by public means?

He is probably not a typical professor in an ivory tower. Rather, I have the impression that I am sitting across from a manager or a politician. A colleague says, "In the polymer science, there is no better manager or communicator than he."

Prof. Gerhard Wegner does not like to hear such comments about himself, he is practiced in understatement. Wegner on Wegner: "I have absolutely no political skills. The only thing that I can sometimes do is to bring people together who otherwise would not talk with one another."

In this he succeeded masterfully in founding the Mainz Max Planck Institute for Polymer Research. Most people in plastics research agree that the Institute would not exist without this 47-year old Berliner.

"At the time of the oil crisis, we realized that we need more information about building up 'intelligent' polymer materials in purposeful fashion. These considerations were quite decisive for the industry to commit themselves to funding the Max Planck Institute for Polymer Research." So reports Dr. Franz Brandstetter, Manager for Research on Technical Plastics at BASF in Ludwigshafen.

Figure caption: To be able to design intelligent plastics on the drawing board, the researchers must know exactly how molecular structure influences the properties of the plastic. The people in Mainz look at the interior of the polymers with the most modern apparatus. By measuring x-ray scattering, they find out how the atoms are arranged. The SQUID magnetometer provides

information concerning the alignment of the molecules in a magnetic field. Molecular vibrations are investigated in the laser laboratory.

The Mainz Institute will also provide future generations of researchers. Up to now, the doctoral students at the universities are practically being wooed by the corporations. For example, Bayer AG invites potential future scientists, already during their thesis work, to give them a taste both of the company and of its locality. If the young Ph.D. in polymer sciences signs a contract at Bayer, one of the attractions might even be a one-year research stay in the USA as a "reward".

The reason for the precarious continuity situation lies in the lack of training offered by the colleges. Students can take a diplomate examination in the area of polymer sciences at 24 German universities, but major departments for this area exist only in five cities.

These universities are far from being able to cover industry's need for polymer researchers. The companies have a specialized polymer scientist available only for one third of the positions that need to be filled. They recruit their remaining needs generally from graduates in organic and physical chemistry.

As is always the case when transferring from college into industrial research, the young scientists first must be specially trained for many tasks in plastics research. This costs the companies time and thus investment. For example, the Bayer conglomerate in Leverkusen figures that a chemist, including laboratory and technical employees, costs 600,000 DM per year.

This deficit in training capacity also was a strong motivation for industry to participate actively in the foundation of the Mainz Institute. About 50 diplomate and doctoral candidates are currently learning there how to handle the most recent techniques and methods of polymer research--a know-how which they can bring along as a morning gift upon their entrance into a business and can apply immediately.

In some cases, the company can not only reduce its training costs, but its new employee also brings it access to the interesting methods that are being developed in Mainz. "We employ the man, buy him his equipment, and then right away he can use the methodology with us. This saves us large development costs", says one industrial representative.

The Mainz researchers wish to create high tech in the plastics area in their most spectacular project: Ultra-thin plastic coatings, about 3 millionth of a millimeter thick or a thousand times thinner than a human hair, are being developed in a large-scale collaborative research program. The Federal Research Ministry is contributing barely 15 million Dm to the 37 million DM total costs of this project.

For Gerhard Wegner, who is directing the scientific program, the magnitude of the funding sum is not the most interesting point: "What is historically important is that, with this project, the former members of the AG Farben--

Bayer, Hoechst, and BASF--for the first time since the end of the war are attacking a joint research project."

Besides the three largest German chemical enterprises, the research groups of Prof. Helmut Ringsdorf at the Institute for Organic Chemistry at Mainz University and of Dr. Dietmar Moebius at the Max Planck Institute for Biophysical Chemistry in Goettingham are also participating in the project.

Wegner sees a plethora of interesting applications for the ultra-thin coatings--called UDS for short. One of his distant objectives is the optical computer: "In the laboratory, the optical analog of the transistor can even now be built. But for its technical implementation, the suitable materials are still lacking. We hope to be able to develop them.

Wegner can also imagine the ultra-thin coatings as photo-resists for chip manufacture or in biosensors. "Artificial kidneys or artificial skins would be applications in the medical area," he speculates further.

The fabrication of the high tech plastic coatings is amazingly simple. A tub filled with water stands in the laboratory of Dr. Christian Bubeck, who directs practical work on this project at the Max Planck Institute. The building blocks (monomers), which later will form the coating, float like a fatty film on the water surface. If one now dips a solid carrier, for example a glass plate, into the water, and again withdraws it slowly, the coating components remain suspended as a fine film on the glass surface. Now the components only need to be cross-linked, for example by irradiation, and the ultra-thin polymer coating is ready.

But enormous equipment is necessary to study the molecular structure of the coatings. For this purpose, the Mainz team has the most modern apparatus, for example its nuclear resonance (NMR) spectrometer, a Raman laser spectrometer, and equipment for x-ray structure analysis. Questions of measurement therefore also are the part which the MPI researchers have taken over in the joint project.

The companies have also equipped themselves well: BASF has built a scanning tunnel microscope for itself, for whose development the IBM researchers Dr. Gerd Binnig and Dr. Heinrich Rohrer last year received the Nobel prize. But the businesses are not making these expenditures because they regard the project as a historical milestone, which might bear fruit in financially-rewarding results.

Rather, Dr. Klaus-Peter Jaeckel, Manager of Research in Reproduction Technology at BASF, explains the motives for participating in the joint project as follows: "We are interested in the methods. Perhaps we can use the UDS know-how for our research on normal photo-resist materials, for lacquers, printing plates, and coatings."

Prof. Rudolf Casper, who directs research in the business area of caoutchouc at Bayer, has a similar view: "Methods for characterizing thin coatings play a great role here. Thin coatings always participate in the corrosion of metals and in the aging of plastics."

For Rudolf Casper, there is also another aspect of the "ultra-thin" coatings project that is important: "The project primarily involved the question of how the chemical industry can make a contribution to build up the Mainz Max Planck Institute. Our main interest was to get the Institute going."

Since the UDS project is still very deeply involved in the area of basic research, it was practically the lowest common denominator on which the three participating industrial enterprises could agree. Because of the exploratory character of the project, the participants need not fear a dispute if actually marketable products were to emerge.

The first building section of the 47 million DM new institute construction will be ready in 1988. Completion of the final expansion is expected in 1990. Then the Institute will have space for 250 staff members.

The Mainz people have declared their "rigid macromolecules" project to be a "model for the cooperation of basic research and industry". Supported by the Federal Research Ministry, they here are collaborating with BASF, Hoechst, and Huelz AG.

In contrast to conventional polymers, where the individual molecules bunch together like threads of wool, the rigid macromolecules have a decisive advantage: They order themselves in a parallel arrangement, similar to floating tree trunks in a river. In this way, it becomes possible to utilize better the strength potential inherent in the plastic.

The first products from such liquid crystal plastics (liquid crystal polymers, "LC-polymers") have already been on the market for some time.

A pioneer in this area was the American chemical giant DuPont with its kevelar fiber.

Another path was pursued by Dr. Mathias Ballauff, who directs the Mainz project "rigid macromolecules". He is trying to reduce the melting point of the rods, by adding flexible side chains as spacers to the main chain of the giant molecules. Since the spacers reduce the interaction between the rods, the melting temperatures of the resulting polymers are reduced.

Ballauff works on a different molecule for each of the participating companies--so that there will be no dispute among them. Following the synthesis directives proposed by Ballauff, the companies in their laboratories "cook" kilogram quantities of molecules designed on the drawing board.

The conversion of laboratory syntheses to a scale appropriate for an industrial laboratory frequently presents difficulties. The products are analyzed and tested both at the Mainz Max Planck Institute and at the respective industrial partner.

With the "rigid macromolecules" project, the key to success also lies in highly complicated investigative methods. Indeed, to be able to design molecules

purposefully, one must have exact knowledge of how these molecules behave within their rigid bond.

Prof. Hans-Wolfgang Spiess, one of the three Mainz MPI directors, has developed a new NMR spectroscopic procedure together with his working team. By means of this procedure, one can precisely determine the orientation of the rods in the solid plastic compound. Staff member Dr. Bernhard Bluemich explains, "In a single experiment, lasting at most a few days, I can now obtain the same information which previously required an expenditure of several years".

Over a period of three years, the MPI will receive a total of 2.8 million DM from the Federal Research Minister for the "rigid macromolecules" project. 200,000 DM of this goes to the participating companies as compensation for work performed contractually in their industrial laboratories.

But the project really conceals a much higher financial expenditure, since the MPI makes available its infrastructure together with its expensive analytical equipment, and since industry makes available their highly specialized industrial laboratories.

BMFT (Federal Ministry for Research and Technology) project funds financed the half million DM for the SQUID magnetometer, by means of which the alignment of the rigid macromolecules is being investigated. This was wholely within the sense of the BMFT conception of promoting collaborative research between scientific institutions and industry.

BASF researcher Brandstetter explains, "I believe that applications could derive from this collaboration. But this will not be the case so quickly, since we are still working on the foundations." In the opinion of his colleagues at Bayer, however, research on rigid macromolecules in the meantime belongs to applied research rather than to basic research.

Because of its intense collaboration with industry, the Mainz Institute has some problems that are foreign to many other Max Planck Institutes.

MPI director Fischer suggests, "On the one hand, we have the pressure from the scientific world which expects good basic research from us. On the other hand, we have pressure from industry, which expects that our research will also yield something practical.

This pressure from both sides is specific to an institute whose topic leans more strongly on industry than an institute concerned with scientific questions which are not directly related to applications."

Problems with the universities could arise from the Max Planck Institute if too many diplomate and doctoral candidates in polymer sciences at Mainz prefer to go to the MPI rather than remaining at the university. Fischer says, "Now we have limited the number of diplomate candidates who can do their research with us." Furthermore, the staff workers at the MPI have declared themselves ready to give courses at the University.

How successful cooperation between industry and basic research may be is shown by a project that Wegner worked on jointly with BASF since 1977--at that time, he was still at the Institute for Macromolecular Chemistry of Freiburg University. Together with his colleague Dr. Volker Enkelmann, Wegner investigated the scientific principles of electrically conducting plastics. In the meantime, BASF, together with Varta Company, has used these principles to work on a "plastic battery". The prototypes of the rechargeable batteries, where one electrode consists of the plastic polypyrrole, were presented last year at the "K86".

Critics have already blamed the Mainz Max Planck Institute for doing contract research for industry. But this is not really the point here. What the plastics industry is missing in order to remain competitive is basic knowledge about polymers and special methods to investigate plastic molecules better.

The American chemical giant DuPont has constructed a research institute within its own business. According to our research understanding, it is a hybrid between the Max Planck Institute, university research, and industrial research. The German chemical industry does not have available a similar corporate inhouse facility. The way the Federal Republic understands itself, basic research falls within the competence of the federal government and of the lands. And so the chemical industry has applied itself to the foundation of the Mainz MPI.

The BASF researcher Brandstetter is hopeful. "We believe that the basic work on polymer research at the Max Planck Institute will give an important impulse to new technical developments."

8348
CSO:3698/420

UK, FRG, FRANCE, ITALY PLAN HYPERSONIC AIRPLANE

Paris AFP SCIENCES in French 26 Feb 87 pp 9-10

[Article: "Negotiations among European Manufacturers on a Hypersonic Aircraft Project"]

[Text] Rome--Several European aeronautical and aerospace manufacturers, including Aeritalia, Aerospatiale, MBB (FRG) and the British space agency, are said to be studying jointly the possibility of making a hypersonic aircraft by the year 2000, the Italian agency AGI announced on 19 February.

The project, which would revolutionize commercial aviation and which, according to the agency, is surrounded by the utmost secrecy, would be the subject of a meeting of European officials of this sector on 17-18 March in Rome. This aircraft would take off like a plane, complete a very-high-speed flight (Mach 5 or more) along a parabolic path in the outer atmosphere, and land again like a normal airplane.

At Aeritalia, on 19 February, no one would comment on this information. Similarly, Aerospatiale in Paris was not in a position to confirm or deny this meeting. Observers in Paris, however, note that the French manufacturer presented the design of a hypersonic aircraft project for the first time on 14 February in Toulouse, on the occasion of the visit of the French prime minister Jacques Chirac, at the time of the first flight of the Airbus A-320.

According to the presentation written by Aerospatiale, in the years 2015-2020, the aircraft could carry 150 passengers at a speed of Mach 5.5 (over 5,000 km/h) over a distance of 12,000 to 25,000 km. It could be equipped with combined ramjet-turbojet engines.

The French engine manufacturer, Snecma, is also carrying out studies in this field. Its SEP subsidiary, which makes the Ariane rocket boosters, is actually working on this project with the Italian BPD, a specialist of powder boosters for space launchers, and with Fiat, we learned from a French industrial source.

The British national space center is also working on a space aircraft project named Hotol, while the engineering departments of German manufacturers are coming out with a competitor, the Saenger.

After the Americans, the Europeans thus show their determination not to be absent from a sector which may represent the means of transportation of the future. Indeed, in June 1985, President Reagan launched a vast research program on the Orient Express, an aircraft scheduled to be placed into operational service in the 1990's to link Washington and Tokyo in 2-1/2 hours. The U.S. manufacturer McDonnell Douglas has already presented, on paper, a project of an aircraft flying at Mach 5 and carrying 305 passengers.

9294
CSO:3698/408

ITALY: TECNOSPAZIO TO SEND ROBOT PROTOTYPE TO SPACE IN 1987

Duesseldorf VDI NACHRICHTEN in German 20 Mar 87 p 8

[Article by Harald Jung: "The 'Weightless' Factory"]

[Text] Milan, March 20--The automation of industrial manufacturing operations apparently knows no bounds, in spite of highly advanced robotics technology. While the vision of the factory devoid of human beings is still meeting with social resistance, it could become reality in the foreseeable future outside our planet.

This is the direction pursued by a new initiative from the Fiat group, whose activities include machine tool construction, telecommunications and aviation, in addition to building cars. Tecnospazio is the name of a company recently founded by the Fiat subsidiary Comau and Fiar in Milan.

The former is numbered among the most important producers of robotics systems in the world, while Fiar is one of the leading companies in electronics for space travel. The new company will have capital stock of about DM 1.4 million and will concentrate exclusively on the automation of manufacturing systems and robotics equipment. The development of industrial articles under conditions of weightlessness will be pushed ahead with substantial expenditures for research and financing. According to Fiat's chief executive officer, Cesare Romiti, this opens up a new dimension of total economic growth. Tecnospazio could become a significant knowledge pool in extraterrestrial manufacturing technologies for Italy and, over the long term, even occupy a leading international role in this field. Prototypes of robots for manned space travel are to go into space as soon as this year. They are intended initially as labor saving devices during the astronauts' activity outside the space capsule. Considered over a longer period, they are considered as forerunners of the players in the factory of the year 2000.

The future plans of the cooperating partners should not be considered overambitious, because both of them are coming from favorable positions: Comau is among the leaders in world rankings in the fields of laser and robotics technology. The company's sales in 1985 reached the equivalent of about DM 1 billion. Among its its best sellers is the Robogate system for automobile manufacture, a flexible assembly process which has found numerous prestigious customers in Europe and the United States. Comau currently employs about 4,300 workers and staff at a total of 9 operating sites in several parts of Italy.

Fiar AG, which has been in existence since 1941, has 4 factories and testing halls outside Milan, where it employs more 1,200 workrs. Last year the company reached sales of 113 billion lire (DM 164 million).

9581
CSO: 3698/406

TDF LAUNCH RESTS ON SECURING PRIVATE FINANCIAL COMMITMENTS

Paris AFP SCIENCES in French 26 Feb 87 pp 6-8

[Article: "TDF-1/TDF-2: The Government Confirms its Commitment to the Program But..."]

[Text] Paris--At an interministerial meeting chaired by Mr Jacques Chirac on 25 February, the government again expressed its "commitment" to direct satellite TV broadcasting "in a European context" while subordinating the launching of the TDF-2 satellite to the creation of a mostly privately owned marketing company. If this company proved unable to find the necessary financing within 3 months, only the TDF-1 satellite, whose financing from public funds is already practically assured, would be launched and operated. Thus launched without its backup satellite, TDF-1 would then be just an experimental satellite.

After the meeting which, in addition to Mr Chirac, was attended by Messrs Edouard Balladur (Economy), Alain Juppe (Budget), Francois Leotard (Culture and Communications) and Gerard Longuet (Post and Telecommunications), a communique was published; it indicates that the government "takes note" of the positions of the manufacturers and operators which "make it possible to consider the creation of a company to finance the construction and launching of TDF-2 as well as the operation of the TDF-1 and TDF-2 satellites, subject to the decisions of the CNLC."

According to Mr Denis Baudoin, spokesman for the prime minister, seven operators, which should represent half of the capital of the marketing company, have already declared their "interest" in making TDF-2. They are "the Hachette group, Bouygues, Hersant-Berlusconi, CLT, the first German television channel, the seventh French cultural channel and a number of FRG radio broadcasters." Here is the full text of the government communique:

"The government confirms its commitment to direct satellite broadcasting in a European context. Following the decision made in July 1986, it now takes note of the positions adopted by manufacturers and operators, which make it possible to contemplate the creation of a company to finance the construction and launching of TDF-2 and the operation of the TDF-1/TDF-2 satellites, subject to the decisions of the CNCL."

"It has given the chairman of TDF mandate to carry out negotiations under the following conditions:

- TDF's interest in the capital of the marketing company: 10 percent;

- Manufacturers' interest in the capital of the marketing company: 40 percent;

- The State will guarantee the TDF1 satellite for up to Fr 600 million. This guarantee will end as soon as the satellite has been received into orbit;

- If a marketing company cannot be created under these conditions within 3 months, TDF will launch and operate only the TDF1 satellite."

TDF1-TDF2 Satellites: TDF Has 3 Months to Succeed

TDF-2, the "twin" of the TDF-1 direct TV satellite, will be launched only if TDF manages to find the required private financing for the project within 3 months. Such is the decision of the French government, which also reaffirmed "its commitment to direct satellite broadcasting in a European context."

In plain language, it means that the TDF1-TDF2 program as a whole will be completed only if the manufacturers and the private would-be operators contacted to set up a marketing company for the two satellites decide that the project is profitable and do not expect massive state aid.

The launching of TDF-1 around the end of the year, which was recently confirmed again in Toulouse by Mr Chirac, is not thrown back into question: it has already been fully financed by the State. But alone in space, without a backup satellite, it could be used only for experimental purposes or for purposes other than direct television, experts estimate.

Around Mr Francois Leotard, this decision is seen as a definite rallying to the arguments put forward by the minister of culture and communications, and also by the ministers of PTT, Gerard Longuet, and budget, Alain Juppe, who, in the past few months, have kept questioning the financial viability and technical relevance of the project. The liberal ministers believe that the private sector alone should bear the financial risk involved in the project, if it still wishes to pursue it.

Mr Xavier Gouyou-Beauchamps, who succeeded Mr Claude Contamine at the head of TDF, has now 30 days left to set up a "marketing company" that will have to finance the launching and operation of TDF-2, at an estimated cost of Fr 1.8 billion. The company should progressively raise at least Fr 600 million in capital in order to obtain the necessary bank loans.

Manufacturers--such as Aerospatiale or Thomson and Philips which manufacture the satellite tubes and antennas--will contribute 40 percent of the capital (a little more than initially planned), the government decided. The operators--i.e. the candidates to operate one of the five channels of the system--will contribute 50 percent. They could include CLT, which now possesses a radio-relay system in France, and maybe also Robert Hersant and "Channel 5" (although the leasing cost of Fr 100 million seems too high to the

owner of the FIGARO), Hachette, Maxwell or maybe Andre Rousselet for "Canal Plus Junior."

Claude Contamine had imagined to require from each would-be operator a contribution of Fr 30 million to the capital of the marketing company. Those among them which would ultimately have been approved by CNCL, which alone can give permission to operate a TV channel, would have had to double their stakes. The others would have been reimbursed.

TDF--i.e. the State--will contribute only 10 percent of the company's capital. However, the government agreed to give the company a start-up guarantee of up to Fr 600 million, which will expire when TDF-1 is in orbit.

People around Francois Leotard point out that he would like to see the success of any satellite project that would make it possible to broadcast French programs in Europe. However, people at the Ministry of Culture do not hide the scepticism inspired by the TDF-1/TDF-2 financial package. "Mr Contamine was able to find only one third to one half of the necessary commitments," they say.

And they point out once again that there exist another solution with good prospects: using communications satellites like Telecom-1, for which small individual antennas, less expensive than those originally planned for direct TV satellites, could be developed rapidly.

In a communique published on 25 February, the National Center for Telecommunications Studies (CNET) made it a point to stress that TDF-1 is not the only satellite that could "ensure evolution toward high definition." "This is not so, and studies made at the CCETT, the joint CNET and TDF center, have never taken a stand on the question of which satellite to choose; they have merely examined the effect of the various parameters involved, including the satellite transmission power and the diameter of the receiving antenna, on the quality of the images received."

"Since TDF-1 is the most powerful of all the satellites that already exist or are planned in the short term, it is easy to demonstrate, based on restrictive hypotheses concerning the diameter of the receiving antenna, that it is the only one that could provide high-quality reception."

"However, a similar performance can be obtained with many other satellites, as long as a larger receiving antennas is used. Thus, the reception of a TV image transmitted by the Telecom-1 satellite according to the D2-Mac standard is already guaranteed with an antenna 75 cm to 1 m in diameter. Of course, to receive a high-definition TV image with the same quality would require either an antenna with a diameter 1.5 times larger, or twice as powerful a satellite. However, the immediate interest of such performance is questionable, considering the limited service life of the satellites involved and the delays encountered in introducing commercial high-definition TV."

9294
CSO: 3698/408

FRG: LUFTHANSA EXECUTIVES ON AIRBUS CHOICE

Hamburg DER SPIEGEL in German 13 Apr 87 pp 62, 65

[Text] In the words of Lufthansa chairman Reinhardt Abraham, he had "never experienced anything like it." The man who is responsible for purchasing airplanes felt that he had been tricked by brash engineers and managers. Abraham's anger was directed at a decision by the engine builder IAE (International Aero Engines). The firm, in which companies from five countries are involved, had announced on Tuesday of last week that it would not be able to supply the planned superfan engine for the new Airbus on schedule--an airplane that Abraham has ordered.

The superfan jet engine was supposed to introduce a new technology in engine construction, a conventional gas generator combined with an adjustable propeller-like fan. It is reputed to produce more thrust and conserve fuel.

The design, an IAE manager explained last week, will continue to be explored. But the companies involved in IAE--among them Rolls-Royce, Pratt & Whitney and MTU from Germany--were not able to offer an engine that was fully developed technically in 1992.

That was precisely what Abraham and his colleagues wanted. The superfan was intended for use in the long-range A 340 planned by European Airbus Industrie, and to be delivered beginning in 1992. Lufthansa was the first airline company in the world to order 15 machines of this type. If the engines are not ready, Lufthansa suffers.

The effects of the loss of the engine will be even worse for the Airbus consortium. The European aircraft constructor wanted to break the U.S. monopoly on the world market for long-range airplanes with the A 340.

For months Airbus has been waging a bitter struggle with the U.S. manufacturer McDonnell Douglas. McDonnell is planning a long-range airplane with its MD 11, which is very similar to the A 340. But world demand is not great enough for both machines. At the end of last year McDonnell was far in the laed. The airplane constructor from Long Beach had been able to book more orders for the MD 11, which was developed from the DC 10, than had Airbus for its new A 340.

Then Airbus caught up. Besides Lufthansa, the French companies Air France and UTA, Royal Jordanian Airlines, the Belgian company Sabena and the U.S. company Northwest Airlines want to put the new European machine into service. Airbus Industrie claims that a total of 128 orders has been received to date for the A 340 and its sister model, the A 330.

The orders came in thick and fast primarily because Airbus was offering the A 340 with the superfan engine. The new engine design was supposed to consume about 25 percent less fuel than conventional power plants. This was such an attractive prospect for many airline companies that they even accepted the A 340's late delivery date. McDonnell is offering its MD 11 2 years earlier.

Even at the time, experts had their doubts that the engines would actually be ready for service as soon as 1992. A manager of the French engine manufacturer Snecma said mockingly: "The airlines want airplanes, not gliders."

But the boards of some airline companies were of a different opinion. The head of Lufhansa, Heinz Ruhnau ordered the A 340, although his engineers advised against it.

Ruhnau had active support from supervisory board member Franz Josef Strauss, who at the same time is head of the board of Airbus. The attempt by Lufthansa engineers to change the board's mind and influence it agaisnt the Airbus was in vain.

Now, however, that the engineers' concerns have been confirmed, the entire A 340 program is in jeopardy. The aircraft constructors had anticipated that the governments of the countries involved in the Airbus would release new funds for the European jet by the middle of this month. That will probably not happen.

Politicians in several countries have made the subsidies dependent on Airbus finding enough customers for its new aircraft. In the wake of the failure with engine that is questionable.

Managers at Airbus Industire are trying to salvage what can still be salvaged. In hastily convened crisis sessions they negotiated an agreement with the engine constortium CFM International for a replacement engine for the A 340.

The U.S. manufacturer General Electric and the French company Snecma, which had formed CFM, are offering an engine that has just as much thrust as the superfan from IAE. The CFM 56-5 engine is based on conventional technology. It is a further development of a unit that already powers the Boeing 737 and the DC-8. Compared with the superfan, the improved conventional CFM engine consumes about 7 percent more fuel.

Lufthansa's Abraham could reconcile himself with hat. The higher fuel consumption is partially compensated for by the fact that the conventional engines are lighter and require less maintenance. So, overall operating costs are only a little higher than with the superfan.

Airbus Industire is attempting to derive some positive benefit from the engine debacle. Now, the Europena joint company ia announcing, there would be no further risks with the new technology. The airline companies could anticipate receiving a fully developed engine.

Aircraft experts in the United States see it differently. They believe that McDonnell's MD 11 will get an even bigger lift. "Now," according to New York aviation expert Paul Nisbet, "a totaly new game is under way."

9581
CSO: 3698/405

BRIEFS

HERMES: FRG FIRMS UNITE--The main West German aerospace companies intend to form a joint company, called Hermes GmbH, to participate in the European space shuttle project, a spokesman for MBB (Messerschmitt-Boelkow-Blohm) announced on 23 February. A preparation group was formed; in addition to MBB, it includes MAN, ANT (Bosch group), AEG and Dornier (Daimler-Benz group). The projected breakdown of Hermes GmbH is as follows: 39 percent to MBB, 28 percent to MAN, and 11 percent for each of the other three companies. This breakdown, however, is not final yet, the MBB spokesman indicated, as other companies may want to join in the undertaking. The groups are also debating where to set up the future company's headquarters. As is known, MBB and MAN have their headquarters in Munich, Bavaria, whereas the Bosch and Daimler-Benz groups have theirs in Stuttgart, in the rival land of Baden-Wuerttemberg. Last fall, the FRG made a commitment to contribute 30 percent to the Hermes project definition stage. The West German aerospace industry hopes that the Bonn government will also commit itself to the implementation of the project, whose goal it is to put a European astronaut in space around 1995. [Text] [Paris AFP SCIENCES in French 26 Feb 87 p 9] 9294

CSO: 3698/408

PHILIPS CAR COMPUTER SYSTEM DESCRIBED

Brussels ATHENA in French Jan 87 pp 27-30

[Text] Specialists at the Philips research laboratories are currently working on a project to equip cars with an electronic copilot capable of routing, guiding the driver to his destination, indicating the car's position, and providing extensive information on the environment and travel conditions. This electronic device has been dubbed CARIN (Car Information and Navigation).

CARIN has a speech capability and a visual display unit (VDU). The device can also be linked through a car radio to traffic control services. A future development along this line could be the RDS (Radio Data System) under study for European standardization and undergoing experimenatl testing in France, the FRG, Sweden, and England.

In the event of traffic jams, roadwork, icy roads, accidents, etc., CARIN's tie-in with the RDS system would, for example, make it possible to identify alternate routes and to change traffic patterns accordingly. RDS digital signals are received by the on-board computer without interrupting or disturbing normal radio programs. A study carried out in the UK has shown that drivers could select their routes with 20 percent greater efficiency if they did not restrict key orientation points to familiar landmarks and locations.

The basic CARIN configuration includes following elements:

- A compact disk player adapted for cars, which can play not only audio disks, but can also read data stored on disk, e.g., road maps, city maps, etc.

- A position-finding device which continuously tracks the location of the vehicle.

- An on-board computer which computes the itinerary and procesess all instructions.

- A car radio to receive traffic bulletins.

- A reproduction and command console with a module that can speak to the user through a voice synthesizer, a screen to provide visual information--display

of a road map, for example--and a keyboard for the driver to enter data or commands into the computer.

High Capacity Reliable Memory

The compact disk was initially intended for recording an hour's worth of music. How many bits of data does an hour's recording represent?

With the compact disk system, the initial analog signals are sampled 44,100 times per second for each of the two stereo channels.

Since the samples are coded in 16-bit words, after 3,600 seconds the quantity of data is 44,100 x 2 x 16 x 3,600 or some 5 billion bits (5 Gbits). The disk is a gigantic ROM memory, with very rapid access in which a complete road map plus all sorts of additional information can be stored.

The digital electronic guide concept was examined in depth; this required adapting the system to its memory function and insuring an error rate of less than one erroneous bit per billion (less than 1 in 10 to the 18th power). That rate is one million times less than the error rate for magnetic computer tapes; this means that even if the disk is scratched or soiled, it is more reliable than magnetic tape.

Some 150,000 Pages

The incorporation of an error correction algorithm means a certain reduction in the available memory capacity because it entails storing additional data to correct errors.

It all works as if an important message were transmitted twice to make sure that it was received. Through a wise choice of error correction algorithm, only 0.6 billion bits is lost rather than half the memory capacity. This means that 4.4 billion of the original 5 billion bits remain available. However, if the duration of the compact disk is increased by 10 percent, raising it to 66 minutes (as is technically feasible), the capacity is raised to 4.8 billion bits, or 600 8-bit bytes.

To better imagine what this memory capacity means, let us calculate the number of A4 [standard European size] typed pages it represents. Each page uses 50 lines of 80 characters. Applying the ASCII (American Standard Code for Information Interchange) standard, where each character represents one 8-bit byte, one page comprises 4,000 bytes. The "extended" compact disk totals 600 million bytes. It is therefore possible to record 600,000,000 : 4,000 = 150,000 pages on a single compact disk.

Coding

Putting ourselves in the position of a digital cartographer, we first record the map on the disk with adequate precision--1 : 15,000, for example.

To be able to clearly distinguish significant topographical features (buildings, waterways, etc.), colors are used. This is necessary for viewing

on the VDU. A current method for analyzing a map point by point consists of examining it with the help of a grid made up of horizontal and vertical lines spaced perhaps 0.1 mm apart.

The map is then subdivided into squares which are 0.1 mm x 0.1 mm or 0.01 square mm. To thus produce a 1: 15,000 map for an area 12 km x 14 km (the approximate area of a city) requires 75 million image elements, to which color must still be added. Thirty colors should be adequate.

With 5 bits, 32 colors (2 to the 5th power) can be generated.

375 million (75 million x 5) bits would therefore be needed, i.e., nearly 8 percent of the total capacity of the compact disk. In addition, it would be difficult for the computer to efficiently retrieve all the road data on the map. That is why another solution was sought. A method using coordinates has been adopted to identify the layout of highways (and of all other traffic ways) showing bends and junctions. With this system, a straight road with no intersections uses only two of these coordinate points--the two extremities.

The layout of a curved road is represented by approximation using rectilinear segments. Every intersection constitutes a junction. The definition of each point requires 32 bits--16 for the abcissa and 16 for the ordinate.

A series of 16 bits offers 2 to the 16th power, or approximately 65,000 combinations (words).

In this case, the position-finding system forms a square with 65,000 (2 to the 16th power) horizontal points and the same number of vertical points.

If accuracy of 10 m (the distance between the points on the network) is required, the total area is:

horizontally		vertically
65.10^3 x 10 m	x	65.10^3 x 10 m
= 650 x 10^3m	x	650 x 10^3m
= 650 km	x	650 km

This yields a map which easily covers a country such as Holland or Belgium, with each landmark situated with an accuracy of some 10 m and requiring only 2 x 16 bits for coding.

We have seen that two points suffice to indicate a straight road with no intersections. For a ring road like the Eindhoven Ring, approximately 40 bends and junctions are needed to describe the layout adequately. (Footnote) (Is there any need to point out that Philips is headquartered in the city of Eindhoven in southern Holland?) Based on a statistical average, every street in a country like Holland can be described by 6 points, each requiring 32 bits. Thus, a total of 192 bits (6 x 92) is needed per street on average; we must then add a 32-bit address to indicate the location elsewhere in memory

of additional information about the points (street names, for example). This is required to make the system easy to use.

Indeed, information should be provided not in degrees of latitude north and longitude east, but in a more familiar form, e.g., Main Street or Union Square. It is therefore necessary to establish a relationship between street names and coordinates; this requires memory capacity. We thus come to a total of 192 + 32 = 224 bits per street (32 address bits for street name).

Let us assume that the typical 12 km x 14 km urban area referred to above, includes 3,350 streets. To describe those streets we need 750,000 bits (3,350 x 224). If we add the same number of bits for coding street names, we arrive at a total of 1.5 million bits, or 0.03 percent of the disk's memory capacity--much less than the 8 percent required by the first method. This calculation only gives us a general idea, of course. If we want to store more information or to have greater accuracy, we need more memory.

Tracking

The CARIN System should make it possible to determine the position of the car at any time. Various technical solutions can be used. The solution dictated for the short term is an electronic compass which makes it possible to determine the direction of the vehicle relative to the earth's magnetic field.

From this directional data and from the distance traveled by the car from its starting point as calculated by the odometer, the on-board computer can determine the car's position. It can also eliminate interference from oncoming or overtaken vehicles or from reinforced concrete viaducts whose iron mass disturbs the operation of the car's compass.

The on-board computer corrects these irregularities by periodically comparing the data with the digital road map. If the calculated position diverges from the route according to the map, the position is corrected automatically.

Other short-term solutions are under study to overcome the problem of disturbances in the earth's magnetic field due to metallic objects of more indeterminate origin.

Navigation by Satellite

In the longer term it will be possible to use the American Navstar Global Positioning System (GPS) for satellite naviations, scheduled for completion by late 1988 with 18 satellites in orbit. Using the part of the system reserved for civilian applications, it will be possible to determine the position of a vehicle any time and anywhere in the world with an accuracy of approximately 10 meters.

The satellites are located in six different orbits evenly distributed around the earth at an altitude of about 20,000 km. Each revolution takes 12 hours. It will thus be possible at any time and any place in the world to receive signals from four satellites, which is adequate for determining longitude, latitude, and altitude, as well as the time (with atomic clock accuracy).

At present, six satellites are already in orbit. By late 1987 there should be 12-enough to determine longitude, latitude, and time.

Communication With the Driver

In designing the CARIN System, considerable attention was devoted to ergonomics, a term which covers ease of use and traffic safety.

In the interest of safety, the computer should communicate its data and advice orally. Thanks to electronic voice synthesis, this is possible.

For safety reasons users will be advised to consult the screen only when the car is stopped. Then, for example, the map can be studied or tourist information requested.

Technical Reality

As already mentioned, destinations can be indicated to the system in everyday language--"Hotel Cocagne, Vestdijk, Eindhoven," for example--so there is no need to struggle with degrees, minutes, and seconds. In addition, the system asks specific questions to determine what the user wants.

The following typical scenario is an example of how the system would operate. Leving Geldrop, the driver wants to go to Evoluon in Eindhoven. He gets in his car and puts the disk on which the maps for Eindhoven and Geldrop are stored into the compact disk player. When the machine is turned on, the following appears on the screen:

CARIN WELCOMES YOU
SELECT THE DESIRED FUNCTION
1. ROUTING
2. TOURIST INFORMATION
3. OTHER FUNCTIONS

The driver types "1" on the keyboard. The screen then displays: PLEASE STATE YOUR POINT OF DEPARTURE. (The driver types the name of the street and the nearest cross-street). PLEASE STATE YOUR DESTINATION: CITY? (The driver types "Eindhoven"). STREET OR DESTINATION? (The driver types "Evoluon").

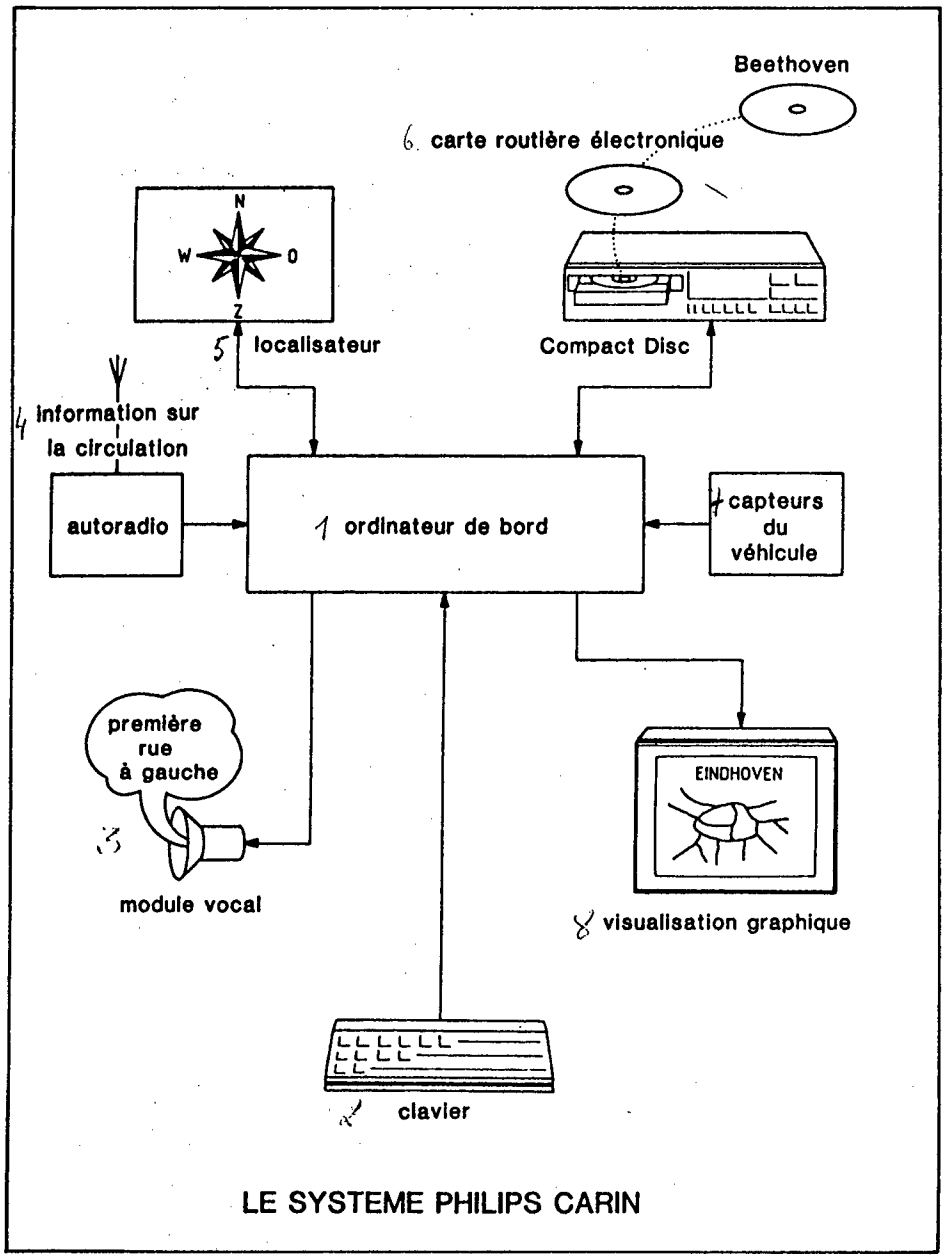
The on-board computer then determines the best route and stores it in memory.

If the driver so desires, he can remove the road guidance disk from the player and replace it with a music disk. After the car starts, CARIN will guide the driver to his destination using the voice module. At some later date, the keyboard will be replaced with a touch-sensitive screen. It will then be possible, for example, to select the name of the street from an alphabetical listing, and the computer will take care of the rest.

CARIN, the electronic copilot, is not some utopian dream but a technical reality which is taking shape at Philips.

Based upon the current state of research, an initial version of the system can be expected on the market in 1988.

Figure. The Philips CARIN System



Key: 1. On-board computer
2. Keyboard
3. Voice module--"first street on the right"
4. Car radio--traffic bulletins
5. Tracking device
6. Compact disk--electronic road map
7. Vehicle sensors
8. Visual display

25050/12951
CSO: 3698/A182

PGS IN BELGIUM DEVELOPS COMMERCIAL BREAKTHROUGH

Paris L'USINE NOUVELLE in French 12 Feb 87 p 34

[Article by Michel Dabaji: "PGS Vaccinates Plants Against Herbicides: A Discovery in a Strategic Field for the Phytosanitary Industry"]

[Text] An important breaktrough has just been made by Plant Genetic Systems, a Belgian company specializing in genetic manipulations in plants. It has successfully made several plant varieties completely resistant to "Basta," a broadspectrum herbicide from Hoechst. The technology used involved injecting the plants with a gene isolated by the Swiss firm Biogen which controls production of an enzyme that inactivates the herbicide.

Basta is a recently developed herbicide so active that even crops may be altered. This limits its applications substantially. Hoechst immediately began to consider buying the license from Plant Genetic Systems, especially since the technique has proven effective for doses up to 10 times stronger than normal, and because it could be applied to a wide variety of species. "This innovation," PGS claims, "would bring down treatment costs for sugar beets by 30 percent and for tomatoes by 50 percent..."

This is feather in the cap of this company (with nearly 300 million Belgian francs in revenues) founded in 1982, whose staff has risen from 20 to 100 employees--especially in a field dominated until now by American biotechnology firms, the most active being Molecular Genetics and Calgene.

Calgene works primarily for Monsanto, Pfizer, Nestle, and Rhone-Poulenc Agrochimie on problems of resistance to herbicides. According to Gerald Assouline, who has just completed a study on the strategy and achievements of the phytosanitary industry published by the Precepta agency, this aspect of biotechnology "is now favored by international agrochemical groups," primarily because "products can be given a new lease on life..."

For this industry, already rather shaken by ecological disasters, must also face the emergence of generic products. "Many patents will enter the public domain by 1990," says Gerald Assouline. "Hence, all firms are frantically racing to their catalogs..." Moreover, this research option also offers the possibility of capturing markets: They will sell the seed-herbicide "technological package." This is why Monsanto is said to keep 50 researchers

working on it, in addition to its subcontractors, while Rhone-Poulenc is researching it jointly with Calgene (sunflowers) and recently began work with Callahan (corn and soybeans) in particular.

The seed-to-product relationship has also pushed these groups to invest heavily in the acquisition of large seed producers, beginning in the 1970's, "without thoroughly justifying the profitability of these investments." This was the strategy of Ciba-Geigy, Sandoz, and Shell. "However, it is not the only possible strategy," says Gerard Assouline. "Others are doing research on plant biology, but still refuse to buy: BASF, Bayer, Dow, and American Cynamid, which makes its selections through the seed producer pioneer."

Finally, the third approach, namely careful investments in the early 1980's was adopted by ICI, Rohm and Haas, Monsanto (through the American company is at present trying to acquire a seed network), and Rhone-Poulenc. The French group, which has just announced a new Fr 21-million EUREKA project to work jointly with Nestle and Limagrain on artificial seed, seems to be sticking to this strategy. It repeats, reassuring seed producers; "We are willing to transfer the technology...."

25012/12951
CSO: 3698/A179

FRG PLANS DATABASE ON JAPAN BIOTECHNOLOGY R&D

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 450, 26 Feb 87, pp 10-12

[Text] Japan's total expenditures on biotechnologies increased by approximately 50 percent from 1981 to 1984, reaching 784 billion yen (more than DM10 billion). Genetic engineering alone accounted for an increase of 150 percent for a total of about 25 billion yen. The biotechnological sector employs more than 100,000 people, half of them scientists.

Japan is expected to rank second after the United States in international bioindustry competition. In particular, basic research activities in genetic engineering and applications-oriented development are being intensified. Crucial to Japan's success even in the biotechnology field is close cooperation between state agencies and private enterprises. In order to gain basic knowledge, specialized research associations and development corporations are set up in the pre-competitive phase with ministerial aid. A total of 129 companies are involved in genetic engineering projects (only 18 in the FRG). The Biotechnology Development Corporation (BIDEC), which includes 175 companies, was established in 1983 with a subsidy from the Ministry of International Trade & Industry (MITI). The Ministry of Health & Welfare plans to pool 150 pharmaceutical companies to form a similar development corporation. Universities are increasingly involved in basic research on genetic engineering. U. S. standards have almost been reached.

These are findings of a 5-year study carried out on behalf of the BMFT [Federal Ministry for Research and Technology] under the supervision of Dr Rolf Schmid, current head of the Biotechnology Research Division at Henkel Ltd. and, beginning on 1 April 1987, director of the Enzyme Technology Division at GBF [Society for Biotechnological Research].

According to Schmid, Japan's success is due in considerable measure to its excellent national and international information base. Japan is far better informed on the situation in the FRG than the FRG is on Japan. The large company pools supported by the ministries run their own offices for collecting and processing data.

In order to close this information gap, the BMFT has funded the establishment of the BIJANCA database (Biotechnology in Japan--National and Corporate

Activities) which, starting in the fall of 1987, will enter the market-testing phase at GBF in Braunschweig.

The following tables provide a general overview of Japan's ministerial expenditures on biotechnology as well as of the most important biotechnology research associations.

Ministerial Expenditures on Biotechnology in Japan (millions of yen)

Ministry	1985	1986	Industrial Participation
MITI	4578	5753	
Including:			
--future industrial generation	1252	1280	yes
--alcohol from biomass	1250	1310	yes
STA (Science Technology Agency)	8608	10408	
Including:			
--B-Hepatitis vaccine	1370	1150	yes
--ERATO projects	1012	1245	
--radiation medicine	1576	2390	
MAFF (Ministry of Agriculture Forestry & Fisheries)	2241	3110	
Including:			
--security of genetic engineering resources	836	915	
--foodstuff bioreactors	409	548	yes
--new animal breeding techniques	280	530	yes
--diffusion of biotechnological methods to the country	-	234	yes
MHW (Ministry of Health & Welfare)	2594	3393	yes
Including:			
--10-year cancer research program	1530	1576	
--security of genetic engineering resources	1019	1032	
Ministry of Culture	18934	13531	
Including:			
--genetic engineering experiments	6090	not available	
--alternatives to animal tests	1558	1605	
--cancer therapy	8616	8944	
--human frontier project	1698	1729	
Ministry of Construction			
--biological compact sewage treatment plants	103	130	yes

Ministry	1985	1986	Industrial Participation
Ministry of Environmental Protection			
--plants as pollution indicators	-	47	
--collection of micro-organisms for environmental research	48	43	
Ministry of Labor			
--biotechnology's impact on jobs	-	8	
Total	37000	42000	

(1) **Wichtige Biotechnologie-Forschungsassoziationen in Japan**

(2) Bezeichnung	(3) Anzahl Firmen	(4) Laufzeit	Budget (Mio Yen)	(5) Ministerium
Research Association for Biotechnology	14	1981-91	25000	MITI
Research Association for Petroleum Alternatives Development (RAPAD)	23	1980-86	26000	MITI
Research Association für Food Bioreactor Development	43	1984-88	907*	MAFF
Research Association for Compact Sewage Treatment Technique	13	1985-89	91*	MOC
Research Association for Development of Hepatitis B Vaccination	8	1982-88	20000	STA

(6) MITI = Außenhandelsministerium
(7) MAFF = Ministerium für Landwirtschaft, Forsten und Fischerei
(8) MOC = Bauministerium
STA = Science and Technology Agency
* Budget 1985/86

Key:
1. Important Biotechnology Research Associations in Japan
2. Name
3. Number of companies
4. Term
5. Ministry
6. MITI = Ministry of International Trade and Industry
7. MAFF = Ministry of Agriculture, Forestry and Fisheries
8. MOC = Ministry of Construction

8703/12955
CSO: 3698/M205

FRG UNIVERSITY EXAMINES INDUSTRIAL USE OF ENZYMES

Duesseldorf VDI NACHRICHTEN in German No 11, 13 Mar 87 p 33

[Article by Meinolf Schmidt: "Enzymes for Industry: New Producers Out of the Multitude of Micro-Organisms;" first paragraph is VDI NACHRICHTEN introduction]

[Text] Duesseldorf, 13 Mar (VDI-N)--In medicine, pharmaceuticals, and technology the utilization of biologically active proteins and catalysts (enzymes) is becoming increasingly important. This area is especially topical because of new capabilities of genetic engineering. In this sector, where biologically active proteins are produced in recombinant cells, short and gentle manufacturing and purification processes are required to avoid impairment of the biological activity of these substances.

The institute for Enzyme Technology was established on 1 January 1986 at the University of Duesseldorf. Prof Dr Maria-Regina Kula, who heads this institute, was previously employed by the Society for Biotechnological Research (GBF) in Braunschweig. Her task is to organize the recently established institute and to create a research program for technical biochemistry.

Basic Research With Obvious Interest for Applications

The design of this basic research is definitely applications-oriented. Two parallel, complementary ideas have provided direction: First, the discovery of enzymes that are capable of catalyzing specific one-step synthesies in industrial processes is a requirement for utilization as a technical catalyst. Second, these enzymes must be produced in sufficient quantities for the development of the process. According to Professor Kula, improvements have been achieved in both areas which make industrial production possible.

The activities in Duesseldorf, on the one had, aim at the utilization of enzymes in industrial production processes, particularly the use of enzymes for the synthesis of chiral products, such as amino acids, which are required both for the manufacture of infusion solutions for artificial nutrition and as component substances for herbicides and pharmaceuticals. For this purpose, the search aims specifically at enzymes with high selectivity which possibly catalyze only one step. Amino acids cant then be

synthesized from suitable and cheap basic compounds with the help of these biological catalysts.

This approach represents an alternative to genetic engineering for the manufacture of simple chiral substances. Because amino acids are not primary genetic products, and because the enzymes for the biosynthesis of amino acids are strictly regulated, genetic engineering is confronted in this area much more difficult starting situation. In this respect, Professor Kula says, this approach promises, at least in the FRG, to be successful for years to come. Otherwise, this specific approach in the search for enzymes and their utilization is pursued only in Japan.

First of all a certain search strategy is being tested which aims at finding a producing agent which will synthetize the desired enzyme. According to Professor Kula, this effort encompasses "physiology, analytics, and hard work." Today, preference in the search goes to new agents among the variety of micro-organisms. For example, within the framework of a German Research Society (DFG) research program, the Institute for Enzyme Technology is presently searching for enzymes which catalyze C-C cross links.

In order to shorten the often lengthy search and selection of suitable micro-organisms from the multitude available, appropriate tests are developed on a case-by-case basis. With the help of soil cultures they allow the determination of whether a suitable enzyme is present or not. For example, a test has been developed which indicates whether an enzyme is present which transforms hydantoins--preliminary forms of amino acids--to amino acids.

In addition, the micro-organisms are subject to a further screening process according to the criteria of activity, stability, and substrate spectrum. In this context, the analysis of the substrate spectrum is especially important with regard to the technical process. The idea is to discover whether an enzyme catalyzes the conversion of chemically analogous substances which do not exist in nature or in biosynthesis, but do exist in the chemical industry.

If a certain number of wild types is isolated according to these criteria, identified by the German Microorganism Compilation (DSM) in Goettingen, and classified as nonpathogenic, then it is possible to start cultivation of these microorganisms in larger quantities. The search process for the enzyme ends with the production of cells in sufficient quantities.

Laboratory Methods at Limits of Capacity

Fewer byproducts and waste products result during enzyme-aided synthesis because enzymes have a markedly specific mode of action. After a successful test run in the bioreactor, the procedure can be optimized both by intentional genetic modification of the strain and by activity improvements.

The second large research area is expected to produce a sufficiently large quantity of enzymes for the development of a technical process for cell harvest and processing. Especially interesting are the early steps of processing in order to maximize yield and to fully exploit the biological activity of an enzyme.

The traditional engineer's technical methods for purification of proteins largely use laboratory methods driven to the limits of their capacity, which results in high costs and loss of product. Professor Kula's achievements bypass to a certain extent the limits of mechanical processing technology.

This is done by liquid-liquid extraction in aqueous phase systems after mechanical cell fusion through wet grinding in ball mill agitation mixers and high pressure homogenization. The liquid-liquid extraction not only isolates the desired product enzyme in the upper phase, but at the same time separates cell debris in the lower phase.

On the one hand, the long known principle of protein distribution in aqueous two-phase systems is used. On the other, the fact that cell debris in a properly adjusted two-phase system collects in drops of the lower phase is exploited. The resulting drop diameter causes a sedimentation speed which even for suspended particles smaller than 10^{-6} m is in the range of seconds or minutes.

In order to further augment the purity of the desired protein product, the institute is currently developing "biospecific catches," agents generating complex structures which are to increase the enrichment of proteins in the upper phase, basically the same approach as in affinity chromatography. Should this combination of physical and biospecific extraction succeed, the chain of processing steps would gain be shortened. Similar objectives are being pursued using membrane separation processes.

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CSO: 3698/M219

FRG BUNDESTAG COMMITTEE ISSUES RECOMMENDATIONS ON GENETIC R&D

Bonn TECHNOLOGIE NACHRICHTEN-PROGRAM INFORMATIONEN in German No 393, 6 Feb 87 pp 2-20

["Excerpts" of the report of the FRG Bundestag Investigative Committee on the Opportunities and Risks of Genetic Engineering; date of issue not given]

[Excerpts] Introduction

The investigative committee has compiled recommendations for the FRG Bundestag on various areas of application, interdisciplinary themes, and legal questions concerning genetic engineering. These recommendations are the final conclusions drawn by the commission from its evaluation of the status of research, development, and application possibilities of genetic engineering and of the opportunities and risks of this technology recognized by the commission.

The recommendations are primarily directed toward the committee's sponsor, the Bundestag. In order to achieve the objectives of the recommendations, legislative measures are necessary in some cases; in some the committee identifies the organizations which the Bundestag must call upon in order to translate the recommendations into decisions and actions.

Recommendations on future decisions for improving the Bundestag's administrative and advisory capacities are drawn from the committee's experiences as a parliamentary technology-oriented advisory organ.

In the following text, all of the committee's recommendations are summarized with short introductions in accordance with the structure of the overall report. For the reasoning behind each recommendation, reference is made to the individual comprehensive chapters of the committee's report.

C 2. Plant Production

Genetic engineering offers opportunities to safeguard nutrition, increase profitability of agricultural production, and bring about environmentally safe agriculture. Therefore, the committee welcomes the application of genetic engineering in plant production. Possible negative environmental effects due to the application of genetic engineering in plant production must be prevented.

The committee rejects the genetically engineered production of plants resistant to herbicides considered ecologically and toxicologically questionable; this is particularly true in the case of outdated herbicides. On the other hand, the committee above all supports genetic engineering methods in developing resistance to disease-causing agents and pests aimed at reducing environmental pollution by agricultural chemicals.

Recommendations

The investigative committee recommends to the Bundestag to urge the Federal Government:

1. To promote research in the area of plant diseases (phytomedicine) as a priority.

2. To intensify the promotion of research in industrial plants (renewable raw materials) with genetic engineering methods.

3. To intensify the promotion of research on the extraction of plant byproducts and plant cell cultures to be used in medicine or agricultural chemistry.

4. To urge the promotion of genetic engineering products in applied research which cannot cause problems when released, particularly in vector development or measures against viral diseases of plants.

5. To increase the inclusion in promoted activities of non-genetic engineering methods for biological pest control and development of resistance.

6. To encourage and support the development of herbicides and herbicide-resistant plants whose toxic and ecological effects are as slight as possible.

Criteria for the ecological and toxicological superiority of new herbicides that come into use in connection with genetically or technically produced herbicide-resistant plants could be the following: lower half-life values of substances for the transition into toxicologically negligible metabolites, and improved specificity of the herbicide. Structure and receptor research can help improve herbicide specificity and therefore should be promoted.

7. To require investigation of herbicide-resistant plants, whose resistance is based on a new molecular foundation, through approval procedure focusing on their metabolic products and properties. It is also necessary to ensure that the related herbicides have passed through the currently available test system and that they have been examined in accordance with the current level of science and technology for example, with regard to their toxicity. This is also valid for herbicide-resistant plants which have been made resistant to so-called outdated herbicides.

8. To involve the Federal Environmental Agency in the design of the ecology-related inquiries related to herbicide approval.

9. To create incentives, through increased awareness and suitable environmental policies, so that users favor application of ecologically superior herbicides.

10. To support initiatives of the EEC and the FAO to set up gene banks of plant material.

11. To determine the need for preserves for conservation of wild plants (and animals) and to develop these protective measures accordingly.

12. To tie the medium-sized plant cultivation enterprises more closely to public research promotion; for example, through joint research projects.

13. To support institutions to carry out genetic engineering research on plants for the requirements of Third World countries, or to create new institutions of this type. In technological cooperation with Third World countries in plant cultivation, special attention should be given to conventional methods, since their potential for optimizing useful native plants has by no means been fully exploited.

14. To prepare a report in which the methods of alternative agriculture, which show fewer undesirable side effects than comparable conventional methods, are examined with regard to their performance potential in terms of producing foodstuffs, raw materials, and energy.

C 3. Animal Breeding

The committee has no objections to the use of genetic engineering methods in animal breeding. For the FRG, this application should focus on improving quality, for example, of meat or increasing animal resistance to diseases. With regard to animal breeding in the Third World the committee also approves genetic engineering arrangements which aim at increasing production.

The committee expresses its support for the preservation of the variety of animal species in agriculture.

Recommendations

The committee recommends to the Bundestag that it urge the state and regional governments:

1. To promote basic biomedical research on transposed gene animals as these methods can provide important new contributions to the development of biology and medicine for humans and animals. This research is to be carried out under conditions that respect the provisions of the Animal Protection Law.

2. To urge the promotion of arrangements in breeding research which lead to an improvement in quality (e.g. of meat) and an increase in resistance to diseases.

3. To conduct a precise analysis of the behavior of residues and the effect on human beings before using endogenous biocatalysts [koerpereigne Wirkstoffe] (as proteins or genes); for example, in growth hormones in animal production.

4. To insure that vector technology procedures follow safety standards. The use of retroviruses in domestic animals outside closed systems is unacceptable. For research purposes, special emphasis is to be placed on developing vector systems which do not use viruses as vectors, but offer alternatives to them (e.g. electroporation) [Elektroporation].

5. To urge the development of serums with subunit vaccines in all possible variations. As long as the so-called vaccine plan is inevitable, care must be taken that no harmful effects for human health occur.

The Committee recommends to the Bundestag that it urge the Federal Government:

6. To promote research projects which aim at involving genetic engineering in domestic animal breeding in Third World countries, both in the form of bilateral cooperation and by supporting multinational research centers. In this case, resistance to diseases and utilization of feeds--that is qualitative and quantitative performance increases in these areas--should be established as a priority.

7. To promptly test possible consequences of transposed gene animal breeding on the structure of agriculture.

C 5. Health

Genetic engineering enables us to gain new knowledge about the origin and course of diseases. The committee sees substantial opportunties in the application of genetic engineering in the pharmaceutical area. Genetic engineering makes it possible to produce numerous new therapeutic substances, vaccines, and diagnostic agents, as well as sufficient quantities of endogenous biocatalysts [koepereigene Wirkstoffe] which currently are available only in small quantities. Sometimes it also provides better quality. Great advantages are also evident in parasitology; for example, in fighting malaria. These developments are to be promoted.

The committee believes that the relevant provisions of the law on pharmaceuticals (AMG) require amendment with regard to the testing and the approval of medicines produced using genetic engineering.

Recommendations

The committee recommends to the Bundestag that it urge the state and regional governments:

1. To increase promotion of the search for additional endogenous biocatalysts [koerpereigene Wirkstoffe] methods for their production in organisms altered using genetic engineering through priority programs within the BMFT [Federal Ministry for Research and Technology] and the DFG [German Research Society].

2. To urge the promotion of research plans which contribute to the growth of even large proteins like coagulation factor VIII as a whole or in components in yeast or bacteria cells instead of in mammal cells in order to avoid possible contamination with viruses.

3. To have these products examined according to the latest level of science and technology for those contaminating ancillary substances, including viruses which are dangerous to human beings as long as there is no alternative to mammal cells in producing many theraputic substances, vaccines, and diagnostic agents which are administered to humans.

4. To promote basic research in conjunction with work on discovering hitherto unknown endogenous biocatalysts [Koerpereigene Wirkstoffe], since research helps to explain the role of these materials in the organism and especially that interactions with other molecules in the human body.

5. To insure that endogenous biocatalysts for the treatment of certain diseases are administered to carefully selected patients and only in clinics as long as there is insufficient knowledge about the physiological effect of such substances. The selection of the patients should take place with the participation of doctors with varied specializations, always including a clinical pharmacologist.

6. To insure through suitable measures that the ethical problems arising in research with neuropeptides are promptly considered in projects concerning the assessment of technical consequences. Experiments in this field should only be undertaken under the supervision of an ethics committee.

7. To urge research plans during vaccine development, which are concerned in particular with the production of subunit vaccines [Untereinheit-Vakzinen] against infectious diseases. This is equally true for the production of vaccines against diseases for which so far there has been no vaccine, as well as for vaccines that would replace existing vaccines because of reduced side effects and greater efficiency. Work on developing vaccines against tropical diseases should take place within the framework of a health policy strategy, which includes the fight against structural ecological and infrastructural factors that are responsible for epidemic infectious diseases.

8. Also to include research on genetic stability of pathogenic germs in a research program for the development of genetically engineered vaccines in order to avoid an acceleration of resistance generation through new vaccines.

The committee recommends to the Bundestag to urge the Federal Government:

9. To establish a research center financed by the federal government, where priority is given to examining clinical-pharmacological issues.

10. To abolish as soon as possible outdated guidelines for testing medical products in accordance with Art. 26 of the AMG and to promulgate the approval requirements for biocatalysts and pharmaceuticals produced

by genetic engineering in accordance with the recommendations of the European Community.

11. To clarify whether the production of materials such as antibodies (for serums) and antigens (for vaccines) is subject to the provisions of the AMG.

12. To draw up provisions to establish the conditions under which clinical tests (on patients) are carried out. The evaluation of possible risks requires in each case a multidisciplinary deliberation based on specialized competence. In Art. 40 of the AMG, the participation of a pharmacist should be required.

13. To draw up a detailed report on the experience gained in each case for the overall approval of pharmaceuticals and monoclonal antibodies produced by genetic engineering and to publish these in reports at 2- and 5-year intervals, and to refer to them in the guidelines.

C 6. Human Genetics (Genomic Analysis and Genetic Therapy)

1. Genomic Analysis

The genetic engineering methods of genomic analysis can be used as diagnostic systems to establish genetically caused diseases, tendencies, or certain characteristics. Possible fields of application are prenatal diagnostics, newborn screening, pharmaco- and ecogenetics, genomic analysis of employees and of insurance beneficiaries, and in criminal and civil litigation. The opportunities and risks of genetic engineering are different for each specific field of application and therefore are to be evaluated differently.

1.1 Genetic Counseling and Prenatal Diagnostics

The scope and precision of prenatal diagnoses are increased and the possibilities of genetic counseling expanded through the introduction of genetic engineering DNA analyses. In the committee's opinion, this is to be welcomed in the interests of the parents involved. However, care must be taken that the DNA analysis is not misused in connection with a possible abortion in the sense that children are chosen according to desirable or undesirable genetic characteristics. Furthermore, the child's right of self-determination must be protected in prenatal data collection. The parents' freedom of choice about the continuation of the pregnancy must not be prejudiced.

Recommendations

The committee recommends to the Bundestag to urge the state and regional governments and professional organizations of physicians:

1. To adapt, through suitable measures, counseling procedures to the broader possibilities of genetic analyses, to increase the staff and technical capabilities as well as the number of genetic counseling and

diagnosis centers, and to improve the qualifications of the personnel in these centers to the extent necessary. Currently valid principles of genetic counseling should also be used in the future, especially if genetic analyses on a DNA level are more intensively used in prenatal diagnostics. Individual recommendations are made as follows:

--For counseling:

1.1 The recourse to genetic counseling and prenatal diagnostics must remain voluntary for the parents.

1.2 It is essential to guarantee that the increased possibilities of prenatal diagnostics do not lead to any "eugenically" determined practice of abortion. Any possible social pressure to abort embryos that are proven bearers of genetic defects must be counteracted immediately.

1.3 The counseling doctor is responsible for calling attention to the handicapped child's right to life during his discussion with the parents. No "directive" counseling may take place in the genetic counseling center. The counseling doctor may exercise no pressure on those seeking advice with regard to any particular decision, for example, in favor of an abortion.

1.4 It is a basic principle that no "active" counseling may be carried out by the genetic counseling center. The counseling doctor shall not actively seek potential patients.

1.5 Genetic counseling should be a requirement for prenatal diagnostics and take place several days before the extraction of cells for a prenatal diagnosis. In this way, the parents are to be given information and time to consider the risk of the cell extraction for the embryo and the mother and the possible difficult choices that may result from the investigation of genetic data.

--For counseling capability and qualifications:

1.6 Genetic counseling and the integration of the diagnosis results into the counseling must be carried out by a doctor. The genetic diagnosis must be drawn up in human genetic institutes.

1.7 The genetic counseling facility should work in close cooperation with a clinic in order to be able to carry out interdisciplinary-diagnostic tasks since those seeking advice often come to a genetic counseling facility believing that abnormalities are hereditary when, in fact, they are not or not entirely genetically caused. Therefore, a high level of multidisciplinary diagnostic knowledge is expected of the medical director of a genetic counseling facility.

1.8 If the genetic counseling facility is not already equipped with interdisciplinary specialists, it would work in close cooperation with a social assistance facility in order to be able to counsel those seeking advice about the social consequences of their possible decisions in case of conflict.

The committee recommends to the Bundestag to urge professional organizations of physicians:

2. To develop an advisory catalog of criteria to assist the counseling doctor's decisionmaking in determining which genetically caused characteristics should be diagnosed, with the participation of various medical disciplines, representatives of self-help groups of patients with hereditary diseases, and representatives of social groups.

In order to prevent any genetic data from being misused as a hidden motive for an abortion on social grounds, the committee recommends that professional physicians organizations agree to give parents only such genetic data gained from a prenatal diagnosis which indicate a severe, untreatable disease before the end of the 12th week of pregnancy.

The commission recommends to the Bundestag to guarantee:

3. That the regulations on data protection provide sufficient protection of the genetic data collected in genetic counseling and prenatal diagnosis.

1.2 Newborn Screening

The committee believes that screening of newborn babies for serious treatable hereditary diseases which occur at an early stage is a valuable extension of the instruments of preventive health policy. No screening for untreatable diseases should be carried out. Genetic data collected in newborn screening are to be protected from misuse.

Recommendations

The committee recommends to the Bundestag to urge the state and regional governments:

1. To draw up, in connection with professional physicians organizations, a catalog of hereditary diseases, which can be diagnosed at an early stage and preventively treated, according to which newborn screening should be carried out. It should also be determined whether the early diagnosis measures provided in the so-called "children's guidelines" are sufficient for the basic principles developed by the committee for newborn screening.

The disease catalog for newborn screening is to be updated periodically on the basis of the progress of medical and technical knowledge. Screening for diseases mentioned in the catalog should be financed by health insurance or by special programs of the regional governments.

The awareness and freedom of choice of the parents with regard to newborn screening shall be guaranteed by suitable measures.

The Bundestag is advised to guarantee:

2. That the regulations of the data protection law provide sufficient protection for the data collected in newborn screening.

1.3 Ecogenetics and Pharmacogenetics

The committee believes that genomic analysis within pharmacogentics for the purpose of choosing a suitable medicine for the individual patient, represents an extention of human medicine. Similarly, ecogenetics offers opportunities to prevent genetically caused harmful reactions to environmental factors. Such investigations must not, however, lead to the stigmatization of bearers of any particular genetic characteristic.

Recommendations

Medicine is given an additional defensive tool to avoid therapeutic incidents through pharmacogenetics, for example, by forecasting undesirable side effects. For this reason, the committee recommends to the Bundestag to urge state and regional governments to promote and coordinate basic research on pharmacogenetics in clinical and molecular biological laboratories. It is considered necessary in the relevant ministries and research institutions, such as the German Research Society, to establish and intensify appropriate research programs, as well as to promote them accordingly. In this connection, the special attention paid to the genetics of medicine receptors and enzyme systems involved in the catabolism of medicines seems to be necessary.

It is further recommended that a committee be established to examine the cost-benefit relationship of pharmacogenetic tests in order to be able to test also the possibility of adopting these preventive measures as special therapy concepts in the catalog of services of health insurance.

The funding of research is similarly indicated for geneomic analysis in the field of ecogenetics, especially for certain heretofore inexplicable phenomena in medicine. It may be possible, for example, that "sudden infant deaths" during the first weeks after birth, which may be caused by a certain genetic structure, could be prevented with appropriate knowledge.

An investigation should be made in cooperation with professional physicians organizations and with health insurance agencies as to whether and for which special areas (e.g., for trips to other parts of the world) voluntary tests may be carried out to prevent genetically conditioned atopies, for example, allergies.

2. Interventions of Genetic Engineering in the Human Cell Genotype

2.1 Somatic Gene Therapy

Genetic transfer in human somatic cells is considered by the committee to be a basically valid form of therapy.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government to implement the following proposed procedures for the development and utilization of somatic gene therapy:

1. The condition for the permission for genetic transfer in somatic cells is the authorization of the Federal Health Service upon approval from the Central Committee for Biological Safety (ZKBS). The latter must examine whether the scientific conditions for a genetic transfer are so well explained that responsibility can be accepted for a therapeutic experiment. In particular, an integral part of this is the determination of whether it is demonstrated that in animal experiments and cell cultures:

--the vector systems are safe and do not harm the organism,

--the new gene is incorporated stably into the desired host cell,

--the new gene is correctly expressed there,

--the new gene and its product harm neither the cell nor the organism,

--the new gene does not enter into untreated cells, especially the germinal cells [Keinbahnzellen]

2. For therapeutic experiments on humans, the regulations approved for therapeutic experiments (Art. 40-42 of the AMG) must be followed. In particular:

--a research and therapy plan must be presented which contains a risk-benefit consideration with reference to the patient as well as a description of possible alternative treatment methods,

--clear medical grounds must be deomonstated,

--an indication must be given about the methods used to select the patients involved,

--the agreement following consultation with the patient or with his legal representative must be produced,

--the protection of confidentially in carrying out the therapy experiment must be guaranteed.

3. The points listed in 2 above should be examined by an ethics committee set up by the Federal Chamber of Medical Doctors, which must approve the therapeutic experiment. This committee will work in the initial phase of clinical introduction at a federal level and shall coordinate its judgments with the ZKBS.

4. The parties directed affected by the therapeutic experiment (the patient and next-of-kin) must be counseled by an additional doctor who is not involved in the research process and therapeutic experiment.

2.2 Interventions of genetic engineering in human heredity [Keimbahn]

The committee believes that interventions of genetic engineering in human heredity [Keimbahn], even as therapeutic experiments, are to be prohibited. In particular, any misuse of genetic engineering for purposes of human breeding is to be opposed immediately.

Recommendations

The committee recommends to the Bundestag:

1. To forbid genetic engineering interventions in human chromosomes cells [Keimbahnzellen] as a criminal offense, insofar as these chromosomes could later develop into fully functioning human beings. This legal prohibition should also extend to genetic transfer in embryonic carcinoma cells (EK cells) or teratom cells, insofar as these are tranferred into a blastocyst to be developed. Interventions in human embryos should also be prohibited by criminal law if these interventions affect chromosomes. Similarly, the committee recommends legal prohibition of breeding of identical clones in humans as well as the formation of chimeras from human and animal embryos, as is also provided for in the proposal for an embryo protection law by the BMJ [Federal Ministry of Justice].

The committee recommends to the Bundestag to urge the state and regional governments:

2. To ensure through suitable measures that gene transfer in totipotent chromosomes, whose further development to fully functioning human beings is not planned, be rendered impossible by compulsory research guidelines.

Section D: On Interdisciplinary Themes

D 1. Safety Aspects When Dealing With Microorganisms and Cells of Multicellular Organisms During Genetic Engineering Research in the Laboratory

The application of genetic engineering has made the utilization of biological materials safer in many areas, for example, the use of pathogenic viruses in vaccine production.

The existing "Protection Guidelines Against the Dangers of In-Vitro Newly Combined Nucleic Acids" primarily involve technical safety rules for genetic engineering work in the laboratory, although additional safety regulations concerning the production field were incorporated in the latest (fifth) edition of the guidelines.

The committee believes that the existing safety guidelines require reexamination and also more precise exposition and in some cases amendment, especially for genetic engineering research with:

--cells (cell cultures) of multicellular organisms

--retroviruses

--oncogenes

--cell fusions and hybrid cells.

A regulation should also be promulgated so that all steps in the processing of cells treated in genetic engineering and their disposal be carried out under the same safety measures required in the laboratory for the genetic engineering experiment itself.

Verifiable training and qualification of laboratory personnel is a prerequisite for working safely with pathogenic viruses or viruses, microorganisms, and cells altered by genetic engineering, without which even the most exacting physical and biological safety regulations would be virtually worthless. Therefore, it is not sufficient to limit qualification requirements solely to the laboratory personnel or even just to the academic personnel. On the contrary, these requirements, suitably categorized, must be valid both for the director of a genetic engineering institution or related production plant and for non-technical personnel working in this sector, e.g., cleaning staff and manual laborers.

The following recommendations for laboratory safety have a close correlation with some of the recommendations for "Workplace Safety in Biotechnological Production Processes" outlined in the following chapter (section D 2).

Recommendations

1. When Dealing With Microorganisms

The committee recommends to the Bundestag to urge the Federal Government:

1.1 To charge the ZKBS with the responsibility for examining whether a higher safety category must be enforced for cloning oncogenes and similar genes which regulate the growth and development of a cell.

1.2 To comply with the regulation in the safety guidelines which provides that the introduction of foreign genes into newly isolated microorganisms may only take place if these microorganisms are approved in terms of the biological safety measures (see Art. 12(2) of the safety guidelines).

1.3 To establish a facility in a public institution, for example, the Federal Health Service or the Paul Ehrlich Institute, to develop pathogenicity tests for microorganisms and to carry out such tests upon request.

1.4 To make sure that the list of classified microorganisms is regularly updated and published.

2. When Dealing With Cell Cultures of Multicellular Organisms, Especially in Mammal Cell Cultures.

The committee recommends to the Bundestag to urge the Federal Government:

2.1 To guarantee that dealing with cell cultures, especially in genetic engineering work, is linked to the demonstration of an adequate training of the operator and that working with mammal cell cultures shall become an integral part or training in microbiology.

2.2 To charge the ZKBS with the responsibility for examining under which laboratory safety conditions research involving cell fusions and hybrid cells--for example, for the production of monoclonal antibodies--may be carried out. In this context, it should be determined, in particular, whether the normal safety measures (see Art. 10 (2) b) of the safety guidelines) used when dealing with cell cultures are always sufficient.

The committee assumes that for technical reasons a safety standard similar to L2 should be sufficient to work with cell cultures.

3. General Recommendation on Performance of Genetic Engineering Experiments

The committee recommends to the Bundestag to urge the Federal Government:

3.1 to extend the definition of genetic engineering experiments in the safety guidelines (see Art. 3(2) of the safety guidelines) in such a way as to make all steps in the processing of cells and their nutritive broth as well as the subsequent disposal of residues considered part of the experiment and thereby make it necessary that such steps be carried out under the safety measures prescribed for the experiment.

3.2 To provide in the safety guidelines that the L3 laboratory safety measures must be respected when dealing with amphotropic retroviruses and with experiments which aim at extending retrovirus host specificity in human beings.

3.3 To order in the safety guidelines that all genetic engineering experiments are to be registered by the Commissioner for Biological Safety (BBS) or by the Committee on Biological Safety (ABS). The recorded data are to be made available at the request of the ZKBS.

3.4 To guarantee that the position taken by the Commissioner for Biological Safety (BBS) or the Committee on Biological Safety (ABS) is the same as the one of the Commissioner for Industrial Safety.

3.5 To draw up and establish the qualification requirements for personnel, including non-technical personnel, in accordance with Recommendation No 4.1 in section D 2 (Workplace Safety in Biotechnological Production Processes).

3.6 To guarantee that health surveillance of personnel working with cell cultures is equivalent to the health surveillance prescribed for genetics laboratories. However, it must be proved to what extent, within the framework of the annual re-examinations, serological tests should be carried out for antibodies for the elements of cell cultures and viruses with which personnel have been working. In all other cases, the recommendations in section D 2 also apply here.

3.7 To promote long-term epidemiological, microbiological, and serological research projects in relation to genetics laboratories and personnel working there.

3.8. To request the competent professional associations to publish the measures of chapters 26 through 30 presented in the safety guidelines in section I "Health Surveillance" and corresponding to the "Precautions in Industrial Medicine" of the UVV [Accident Prevention Provisions], VBG 100 [Union of Professional Associations] and to promulgate specific concrete regulations concerning the protection of public health.

D 2. Workplace Safety in Biotechnological Production Processes With Organisms and Viruses Altered by Genetic Engineering

Genetic engineering has great innovation potential for new production processes in the fields of pharmaceuticals, chemicals, and foodstuffs. Biotechnological production processes with organisms and viruses altered by genetic engineering involve new safety aspects, which must be promptly analyzed and evaluated. Any threat to human beings caused by genetic engineering processes and products inside or outside production plants must be avoided by appropriate measures.

Decades of experience in working with highly pathogenic microorganisms and viruses, both in the laboratory and in manufacturing during vaccine production, show that there are safety techniques available for handling these microorganisms and viruses. For the most part, these experiences and standards can be transferred and extended in connection with the handling of dangerous or potentially dangerous organisms altered by genetic engineering. It is also necessary that production be based on a combination of biological and physical safety measures.

An essential prerequisite for safety in production work is qualified training for all personnel working in the field of genetic engineering production.

Recommendations

1. On the Binding Character of the Safety Guidelines

The committee recommends to the Bundestag:

1.1 to make safety guidelines for genetic research establishments and related production plants for the protection of human beings, animals, and the environment legalling binding. The guidelines must be adapted to the level of science and technology as has been the case thus far.

1.2 To urge the professional associations to list "Biotechnology" in existing regulations for the field of production in the accident prevention provision (UVV) currently being drawn up.

1.3 To urge the regional governments to likewise declare the "Biotechnology" UVV legally enforceable for technical universities and other public institutions through a corresponding decision.

1.4 To urge local accident insurance companies (GUV or BAGUV) to adopt the regulation of the professional associations.

2. On Biological Safety

The committee recommends to the Bundestag to urge the Federal Government to [act as follows with respect to] the "Provisional Recommendations for Handling Pathogenic Microorganisms and for Classifying Microorganisms and Viruses According to the Dangers Occuring as a Result of Handling Them" (see appendix 3);

2.1 To comply with the procedures to be determined in accordance with the level of scientific knowledge acquired. At the moment, it cannot be assumed that this list is complete. Newly discovered microorganisms may be registered in this list; their risk potential therefore is currently unknown.

2.2 To declare [these "Provisional Recommendations"] generally binding in connection with the proposed amendment to the Federal Law on Epidemic Diseases (Compare with recommendations on legal enforcement and safety guidelines in section E 2.).

The committee recommends to the Bundestag to urge the Federal Government to [act as follows with respect to] the classification of organisms and viruses to be used in production:

2.3 To undertake [such classification] with regard to the interaction of organisms used in production with other organisms according to human, animal, and plant pathogenic, toxicological and environmentally relevant criteria. Available test procedures are to be further developed and confirmed for this purpose. This provision also should be valid for organisms modified by genetic engineering.

2.4 To harmonize or, to standardize [such classifications] according to their individual risk potential on an international level or at least on a European Community level.

The Federal Government should further:

2.5 When classifying cell cultures (even if genetically unmodified), consider their principal pathogenic potential.

2.6 Examine the advisability of classifying cell cultures as a biological safety measure.

2.7 Ask the ZKBS and the BGA [Federal Health Service]

--to specify under what conditions the following [four] criteria (listed in the safety guidelines) for certification of biological safety measures have been met (article 9):

[1] adequate understanding of the properties of host organisms as well as of their position in the biological system and behavior in various ecological systems;

[2] identifiability and controllability in the ecosystem, including controlled destruction as well as retrievability;

[3] experimental proof that no exchange with animal- or plant-related organisms takes place;

[4] availability of suitable measures by which any spread of the organism outside the laboratory can be kept under control at any time.

--for reasons of legal clarity, to list the "Standard Safety Precautions in Tissue Culture" prescribed by the safety guidelines for handling cell cultures, and to include the guidelines as appendix.

3. On Technical Safety

The committee recommends to the Bundestag to urge the Federal Government:

3.1 To establish detailed criteria for the definition and limitation as well as for technical equipment of laboratories, technical colleges, and production plants, including the determination of an upper permissable limit for the total volume of biological agents to be used at any one time.

Similarly, criteria must be established on which measurable requirements must be satisfied before authorization may be granted to transfer to the next higher production level.

3.2 To guarantee in a legally enforceable manner that the dual protection system of professional associations and industrial safety and health control for authorization and monitoring of prescribed industrial establishments and equipment, as well as the establishment of measures to organize research, encompasses all genetic engineering laboratories and related production plants. Task coordination and control functions for the activities of industrial safety and health control, professional associations and the ZKBS must also be guaranteed.

3.3 To guarantee that release [of genetically engineered products] will be reduced to a minimum even with the lowest physical safety level (LPO).

3.4 To guarantee in a legally enforcable manner that biologically active recombinant nucleic acids shall be deactivated for safety reasons in case of potential risks, if possible, before reprocessing them, but in any case before their disposal. Should deactivation not be possible before reprocessing, reprocessing must be carried out in accordance with the same safety measures as production (fermentation).

3.5 To draw up concrete safety measures which guarantee the most extensive protection possible against an unplanned release caused by "external incidents" such as, for example, natural catastrophes, effects of accidents in neighboring departments of the installation, etc.

3.6 The currently valid provision, which requires that for levels LP1 through LP3 the technical design of the working environment is to be established to ensure that the release of the entire contents of a closed system can be captured within the working area, is to be amended to define the provisions for dealing with subsequent decontamination and disinfection.

3.7 To promote and initiate measures that enable the level of technical protection against biological dangers to be extended, that is, the further development of technical safety standards, especially in the fields of:

-- sterile bioreactor technology,

--safe processing in fermentation plants,

--recognition and treatment of foreign infections in bioreactors,

--technical measures to prevent germs from being released into the atmosphere of the working area and into the environment (exhaust gas and waste water problems),

--avoiding contact of microorganisms, viruses and their products with human beings in production and reprocessing,

--treatment and elimination of wastes from biotechnological processes,

--decontamination and disinfection procedures,

--procedures and monitoring systems for microorganism/virus detection, to make possible continuous control of the functioning of technical containment.

4. On Human Safety

The committee recommends to the Bundestag to urge the Federal Government:

4.1 To guarantee in a legally enforcable manner that in genetic research establishments or related production plants the academic and laboratory personnel, as well as technical college and production staff--classified according to the characteristics of their activities and training--possess certificate qualifications. These qualifications will enable such personnel to perform correct assessments of the hitherto unknown dangers of these new techniques and act accordingly. Certification of qualifications could be provided through pertinent basic interdisciplinary courses or, could become for the longer term, an integral component of professional training or study.

4.2 To establish the minimum requirements for the theoretical and practical content of such basic interdisciplinary courses as soon as possible, in cooperation with the ZKBS, professional associations, industry, trade union representatives, and scientific organizations, and to create the organizational and institutional conditions for conducting such courses.

4.3 To initiate long-term epidemiological, microbiological, and serological sampling in work areas where personnel come into contact with biological agents.

The commission recommends to the Bundestag to urge professional associations:

4.4 In view of their responsibilities, to register the measures of chapters 26 through 30 mentioned in Section I, "Health Surveillance," of the safety guidelines in the "Precautions in Industrial Medicine" UVV [according to] VRG 100 [Union of Joint Economic Associations] and to establish concrete specific regulations for preventive health protection, for example, by amending the professional association regulation on "Infectious Diseases" (G42).

4.5 Relative to these recommendations, to take into consideration the special characteristics of medical research in the working world and in the field of data protection (compare recommendations in section C 6, "Genomic Analysis of Employees," especially recommendations on medical research in the working world and to protect the employee's genetic data).

D 3. Effects of the Application of Organisms Altered by Genetic Engineering on Agriculture and Environment (Release Issues)

Genetic engineering offers mankind new opportunities to influence natural evolution, through controlled gene exchange, which transcend all the boundaries of the species with unprecedented speed and directness. In this respect, we bear a special responsibility for the timely assessment of the ecological compatibility and the toxicological effects of a deliberate release of organisms altered by genetic engineering into the environment, and to investigate whether such a release is ethical. The characteristics of viruses, microorganisms, plants, and animals are so different that the evaluation of the consequences of a deliberate release must be undertaken separately for each of them.

1. Release of viruses altered by genetic engineering

Basically, every deliberate release of viruses is problematic, whether they have been altered by genetic engineering or not. Viruses can interact with a broad spectrum of living cells and organisms. Because these reactions can be extremely varied, the spread of viruses normally cannot be controlled nor can its long-term effect be forecast easily. As a rule, therefore, their release must not be allowed.

Exceptions can be permitted for vaccination and, under certain circumstances, for plant protection.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government:

1.1 As a rule, to forbid in the safety guidelines the release of viruses altered by genetic engineering.

1.2 To provide for exceptions to this prohibition for the utilization of viruses as vaccines in human and veterinary medicine. The regulations concerning somatic genetic therapy for human beings remain unaltered.

1.3 To intensify investigations into the possibilities of employing baculoviruses in pest control and plant protection. To this end, experiments should be undertaken as soon as possible with viruses altered by genetic engineering under conditions of physical containment (e.g., in green houses). After assessing these experiments, the Federal Health Service will be in a position to grant exceptions to the standing prohibition of releasing viruses, upon consultation with the ZKBS and in agreement with the Federal Biological Institute for Releasing Baculoviruses

Altered by Genetic Engineering. This is not valid for baculoviruses with deliberate altered host specificity. The same procedure is to be followed with plant viruses of the CMV type. Any change in the prohibition in the safety guidelines against releasing viruses altered by genetic engineering shall follow the same procedure as is provided for the examination of the moratorium proposed by the committee on releasing microorganisms altered by genetic engineering.

1.4 To promote the development of newer, safer vaccines through genetic engineering which may offer an alternative to utilizing complete viruses (so-called subunit vaccines [Untereinheits-Vakzine]).

2. Release of microorganisms altered by genetic engineering

Although today we already have at our disposal important points of reference to assess the behavior of microorganisms in an ecosystem, these are not enough to be able to predict the course of a releasing experiment with sufficient certainty. Therefore, in line with the "biological containment" in laboratory research, studies must be intensified on safety and ecological effects in order to develop equivalent possibilities for controlling and limiting the effect of released microorganisms. In particular, methods must be developed which permit improved detection and control of the survival capability, genetic stability, propagation capability, and the ability of microorganisms which might be released to form toxic or pathogenic materials.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government to implement the following proposals through suitable measures:

2.1 The deliberate release of microorganisms in which foreign genes have been introduced by genetic engineering must continue to be prohibited in the safety guidelines. After 5 years, a decision must be made, with the participation of the Bundestag, as to whether new knowledge enables the consequences of such experiments to be suitably assessed and justifies the repeal of this prohibition.

2.2 In the meantime, a medium-term program of safety research must be carried out by the BMFT to systematically define the principles and criteria that will permit an evaluation of the risk potential of microorganisms altered by genetic engineering and their interactions with an ecosystem. Such an interdisciplinary research program must be carried out publicly. The ZKBS, scientific organizations, scientific authorities, industry, trade unions, and environmental protection groups must be involved in the assessment of the results.

2.3 The deliberate release of large quantities of identical, intentionally cultivated microorganisms must be subject to a procedure of notification and authorization, which must be laid down in the safety guidelines. Compulsory notification and authorization is valid for experiments with

microorganisms that have not been altered at all or only by traditional methods, just as for microorganisms altered by genetic engineering where individual genes have been removed. These measures should not be applied to biotechnological procedures introduced to deal with cultivated microorganisms in the field of foodstuffs or other consumer goods (e.g. beer brewing), of agriculture (e.g., [ensilaging]), and of waste-water purification plants.

2.4 The decision concerning a request for release will be made by the Federal Health Service on the recommendation of the ZKBS. The Federal Environmental Service shall be involved in the decision in an appropriate way. Both small-scale experimental field tests and large-scale applicational field tests shall be subject to this authorization procedure.

2.5 Microorganisms that are pathogenic for human beings or domestic animals or that form toxins active against them are to be absolutely excluded from deliberate release.

2.6 Suitable test procedures shall be provided for releases which enable the pathogenicity and toxicity for plants and animals to be examined. The applicant must present a risk estimate and a risk evaluation. The catalog of criteria must be comprehensive and adapted to the particular situation. The criteria of judgment will vary from case to case. Criteria are to be developed by the ZKBS to determine on the basis of what conditions tests may be transferred gradually from the experimental area into the field.

In the opinion of the committee, the following criteria for risk evaluation, in particular, are to be taken into consideration:

a) efficiency of and need for the measure;

b) existence of alternative methods (e.g., chemical methods, supporting the growth in situ of existing microorganisms with desired catabolic performance);

c) safety and environmental tolerance of the measure. (Preference should be given here, for example, to using naturally occuring microorganisms that were isolated in an area comparable to the release zone.)

2.7 The Federal Government is urged to commit itself to the harmonization and coordination of all measures for deliberate release of microorganisms and viruses across borders (possibly at a worldwide level). The Federal Government should intensify its efforts on the basis of the proposals described here. On a worldwide level, all experience in this field should be collected, coordinated, and published, perhaps by WHO.

3. Release of plants altered by genetic engineering

In view of the variety of cultivation methods, it is difficult to treat the deliberate introduction of individual genes through recombinant DNA

techniques differently from traditional cultivation procedures. Nevertheless, there are some important criteria which have some significance in the release of plants altered by genetic engineering.

For example, the question should be examined of whether any possible toxic effect for human beings or domestic animals is to be expected from the plant's genetic product altered by genetic engineering. It is also necessary to clarify to what extent an undesired transfer of genes to other plant species can take place.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government to enact the following regulations:

3.1 All experiments in producing and releasing plants altered by genetic engineering must be communicated to the ZKBS. Experiments in green houses as well as small- and large-scale field tests require ZKBS safety examination and consent. In the initial phase, care must be taken that the vectors used possess no autonomous replication capability; furthermore, it must be determined that the newly introduced genes are actually integrated into the genetic patrimony of the plants.

3.2 Field applications may be made on condition that permission is granted by the Federal Health Service after consultation with the ZKBS and in agreement with the relevant federal biological institute.

3.3 Authorization for field applications must be based on a risk evaluation by the user (e.g. the cultivator) with special attention to environmental tolerance and toxicity. With regard to toxicity, the valid provisions about pesticides and insecticides are to be used as appropriate.

The Federal Government should further be urged:

3.4 To aim at the harmonization and coordination of all measures on releasing plants altered by genetic engineering, across borders (possibly at a worldwide level), and at setting up a worldwide information system on releasing plants altered by genetic engineering, for example, at the FAO.

3.5 Also to initiate or promote projects which investigate the extent of horizontal and vertical gene transfer through plants altered by genetic engineering within the framework of promoting risk and safety research.

4. Release of animals altered by genetic engineering

The dangers in releasing animals altered by genetic engineering stem primarily from the possible ecological effects. Therefore, releasing animals altered by genetic engineering can only be permitted if the diffusion of such animals remains under control, that is, if they can be "retrieved."

There is no obstacle to the release of domestic animals altered by genetic engineering which are dependent on man; for example, if they live in enclosed areas.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government:

4.1 To maintain the existing limitations in the safety guidelines on releasing small life forms altered by genetic engineering and capable of reproducing (insects, worms, etc.).

4.2 To make the release of larger wildlife altered by genetic engineering, which live independently of man, subject to the approval of the ZKBS. The ZKBS decision shall be preceded by a risk-benefit comparison, to be carried out by an interdisciplinary committee independent of the ZKBS, in which ecologists, toxicologists, medical hygenists, and evolutionary biologists shall participate.

D 4. Effects of Genetic Engineering Procedures and Products on Jobs, Qualification Requirements, Production Structure, and Market.

Only general guidelines can be given about the effects of the introduction of genetic engineering methods on the production structure, qualification requirements, and levels of employment in various areas of industry.

The promotion of genetic engineering will lead to no notable positive effect on the labor market in the short term. In the medium and longer term, there may be more or less strong direct and indirect effects on the labor market, for example, in the chemical-pharmaceuticals industry, agriculture, and the foodstuffs industry. Here, on the one hand, the creation of new products can be expected to expand employment, while on the other hand, rationalizing effects will reduce labor. Therefore, it is necessary to estimate the consequences promptly in order to be able to deal on a policy level with areas where increased demand for new qualifications occurs or where large-scale labor market changes are expected.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government:

1. To link further promotion of industrial exploitation of genetic engineering in various sectors of the national economy to corresponding investigations into their consequences for production structure, qualification requirements, and jobs.

2. To examine the extent to which industrial exploitation of genetic engineering requires new worker qualifications.

3. To examine the extent to which the change in qualifications can be accommodated by further training and retraining and the extent to which

this must be borne in mind when designing the content of new training courses and training regulations (see also the recommendations on industrial safety in biotechnological production processes in section D 2.).

D 5. Genetic Engineering and the Third World

Although the problems concerning health, nutrition, raw material, and energy supply in the Third World are not caused entirely by technical factors, genetic engineering can make important contributions to solving these problems. Of course, the development and application of genetic engineering requires great expenditures, as well as a well developed infrastructure for research and education. These conditions are not met at the moment in many Third World countries. In the absence of suitable measures, the already existing gap in these fields between the Third World and the industrialized nations can be expected to grow.

Recommendations

The committee recommends to the Bundestag to urge the Federal Government:

1. To intensify its promotion of projects for the evaluation of the technological consequences of transfering genetic engineering to Third World countries and using it in these nations, primarily through international organizations.

2. To intensify its promotion of bilateral research programs in genetic engineering as a part of its scientific exchange with Third World countries.

3. To support the International Center for Genetic Engineering and Biotechnology (ICGEB), a joint foundation of the Third World countries, through the FRG's membership. Beyond this, the Federal Government should encourage the membership of other industrial countries in the ICGEB.

4. To support research projects in the field of parasitology, which are particularly important for Third World countries.

The state and regional governments should be urged:

5. To promote partnerships between technical institutes working in genetic engineering and similar institutes in Third World countries. A partnership program should be drawn up and financed by the state and regional governments upon scientific approval.

D 6. Utilization of Genetic Engineering for Military Purposes

The development of vaccines with the aid of genetic engineering may not be permitted to facilitate the use of biological weapons. The committee welcomes the agreement reached in 1986 by the Second Examination Conference of the Biological Weapons Treaty to carry out information exchanges among the signatory states.

Recommendations

The committee recommends to the Bundestag:

1. To urge the Federal Government to work within the UN framework through suitable measures to maintain the ban on developing, producing, and using biological weapons throughout the world, including new technical possibilities from genetic engineering and, furthermore, to agree on a ban on biological weapons research as well as the regulation of a verification process.

2. To urge the Federal Government to persist in abandoning biological weapons research in accordance with the 1972 Biological Weapons Treaty.

3. To guarantee together with the Federal Government that genetic engineering research projects in the FRG are not carried out in military establishments or financed through the defense budget. Military medical projects are exempted but must be conducted with the full knowledge of the public.

4. To urge the Federal Government to examine the guidelines of the ZKBS to determine whether further regulation is necessary to prohibit research and development in biological weapons using genetic engineering and, if necessary, to extend the guidelines accordingly.

D 7. Overview of Genetic Engineering Research and Development

Genetic engineering research and development is carried out in the FRG on a scale which otherwise is found only in the United States and Japan.

The committee welcomes the Federal Government's plan of promoting genetic engineering within the framework of extensive research programs, for example, in the "Applied Biology and Biotechnology" program, rather than in a special project in order to use genetic engineering's innovation potential in all fields of life sciences (biology, biotechnology, nutrition, agriculture; health, medicine, and environmental protection).

Genetic engineering methods for altering the properties of organisms developed first in basic research early demonstrated the diversity of their practical use. As a result, the Federal Government developed strongly application-oriented plans for research promotion for genetic engineering. The committee supports the opinion that such an application orientation of basic research must not be allowed to become a general principle of state research promotion.

Recommendations

As an extension of its recommendations on research promotion in individual fields of application, the committee recommends to the Bundestag to urge the Federal Government:

1. To take into greater consideration the entire range of possible applications of genetic engineering when promoting applied research, in addition to concentrating on pharmaceutical research projects.

2. To design public subsidy measures in such a way as to ensure that small and medium-sized enterprises working in various fields have greater access to genetic engineering know-how than has been available to date for example, through joint research projects and indirect specific promotion. Similar measures should also be enacted to make it easier for industry to participate in genetic centers.

3. Not to make the "application-oriented basic research" in genetic engineering, which has intensified in recent years, into the general principle of state promotion of research. The flexibility necessary for long-term planned basic research which is not oriented toward defined practical applications must remain intact.

4. To carefully define tasks in the framework of research promotion, such as the application of genetic engineering in health care--for example, in diagnosing and treating cancer, heart and circulation problems and infectious diseases--as well as in safeguarding resources and the environment in production and disposal.

5. To intensify the distribution of research scholarships, through which new generations of scientists can be trained in a qualified way in the field of genetic engineering in suitable research institutes both at home and abroad.

6. To promote genetic engineering also in the future within the framework of very general research programs like the "Applied Biology and Biotechnology" program or the health research program, in order to keep genetic engineering in the context of biotechnology and life sciences. In this way, it should be recognized that genetic engineering is in no way a totally separate field. Thus, promotion cannot be limited to the current field of genetic engineering. Other fields of biological and biomedical sciences must continue to be integrated in an interdisciplinary fashion into research promotion.

On Section E: Legal Issues of Genetic Engineering

E 2. Statutory Reinforcement of the "Guidelines for Protecting Against Dangers Through In Vitro Newly Combined Nucleic Acids"

The committee believes that the guidelines have proved their basic worth and therefore should become compulsory in the future for all users of genetic engineering methods. Moreover, the regulation should be limited by a formal statute to the terms required by constitutional law for reasons of flexibility and should be enforced by legal ordinances.

Recommendations

The committee recommends to the Bundestag:

1. To enact general, compulsory safety regulations for genetic research establishments and related production plants in order to protect human beings, animals, and the environment.

2. To undertake this legal standardization by amending the Federal Law on Epidemic Diseases and changing its name to "Law Regulating Biological Safety."

3. In this law, to empower the Federal Government to issue the necessary legal standards. The law must also include:

a) The obligation to register the activity of genetic laboratories and related production plants in a central registry.

b) The possibility to subject certain genetic engineering methods to approval procedures, or to prohibit them entirely.

c) Provisions of sanctions for violations of this law or of one of the regulations deriving therefrom.

d) The responsibilities of the Federal Health Service and of the Industrial Safety and Health Service and the tasks of the ZKBS as well as the relationship between these institutions.

The committee further recommends to the Bundestag to urge the Federal Government:

4. To regulate the following, in particular, in legal standards which reflect the level of science and technology:

a) The requirements for safety, as well as for training and health surveillance of employees.

b) The establishment of a central registry for genetic laboratories and related production plants at the Federal Health Service.

c) The empowering of the secretariat of the Central Committee for Biological Safety to cover the following jurisdictions as:

--a registry for genetic laboratories

--an institution for judging and approving special genetic engineering research

--an advisory office for institutions, public authorities, and individuals.

d) The composition of the ZKBS, with the participation of specialists in the fields of industrial, health, and environmental protection, as well as of the organizations supporting research.

5. To work toward the harmonization of these legal regulations internationally, at least at European Community level.

E 3. Civil Liability for Genetic Engineering Accidents

Even with adherence to regulations which reflect the level of science and technology, certain risks cannot be fully ruled out in any field, including genetic engineering. In the opinion of the committee, absolute liability should apply to those genetic engineering methods and products which require authorization according to the safety guidelines. All other procedures should be subject to liability for damage caused by intentional and negligent acts only.

Recommendations

1. The committee recommends to the Bundestag to introduce absolute liability for all genetic engineering projects which require authorization according to the safety guidelines valid at the time in question. The introduction of an upper ceiling on liability and compulsory insurance is recommended.

2. The committee further recommends to the Bundestag to urge the Federal Government to work for the necessary international harmonization in this field.

E 4. Criminal Liability for Violations Against Legal Provisions in the Field of Genetic Engineering

The committee does not believe that the existing provisions of criminal law are adequate to protect third parties and the environment against damage which could result from incompetent execution of genetic engineering experiments. To the contrary, the committee believes that not only harm but also in certain cases the jeopardizing of legal rights of others should be absolutely prevented under penalty of law.

Recommendations

The committee recommends to the Bundestag in regulating the safety guidelines by legal reinforcement:

1. To punish any deliberate violation of the prohibition against certain genetic engineering experiments.

2. To enact provisions that threaten penal action against all other deliberate violations against the level of science and technology of genetic engineering as established in the safety guidelines, as long as the life and well being of third parties, the property of significant value of third parties, or nature and wildlife are jeopardized.

E 5. Advisory Committees on Genetic Engineering

The investigative committee considers the medical ethics committees to be an efficient instrument in protecting patients and test subjects and approves their intervention in allowing genetic engineering experiments on humans.

In addition, the committee believes that it is necessary to establish a central group to advise on basic legal, ethical, ecological, and social issues of genetic engineering.

Recommendations

The committee recommends to the Bundestag:

1. To enact a regulation whereby all genetic engineering research on human beings is allowed only upon prior approval from a state-authorized local ethics committee. The local committee's position should be further communicated to the Federal Health Service. Finally, the Federal Health Service should authorize the project or withhold its authorization. Such a regulation should lead to a modification at the local commission level, that is their composition should be altered or expanded, perhaps by the addition of an expert in the field of medical genetics.

The committee further recommends:

2. Establishing a consultative committee in the BMFT or in the Parliament whose task will be to observe the continuing development of genetic engineering in all fields and to assess it, along with the possible social effects resulting from it.

3. Constituting this consultative committee as follows:

a) Three members of the ZKBS, one from each of the groups represented in the ZKBS.

b) Representatives of trade unions, industry, churches, the parties represented in the Bundestag, and the organizations for environmental and nature protection.

c) Additional experts from various disciplines, especially, natural, legal, and ethical sciences or theology as well as medicine.

Women should be adequately represented in the membership.

d) One representative of the following institutions:

--the working group of medical ethics committees;

--"Central Committee of the Federal Chamber of Medical Doctors for Safeguarding Basic Ethical Principles in Human Embryo Research";

--The central animal protection committee, according to Art. 15b par. 1 of the Law for Animal Protection.

E 6. Protection of Commercial Legal Rights for Genetic Engineering Developments

Recommendation

The committee recommends to the Bundestag to examine whether amendments to the law on the protection of commercial legal rights (trademark and patent protection) with regard to plants and animals are necessary as a result of the development of genetic engineering.

On Section F: The Investigative Committee as an Instrument in Estimating and Evaluating the Consequences of Technology for the Bundestag

The establishment of a special advisory and administrative capacity for forecasting the consequences of technology has been under discussion in the Bundestag for years. The Investigative Committee on "Opportunities and Risks of Genetic Engineering" would like to make use of the work presented here, while also mentioning earlier investigative committees of the Bundestag into technology-related fields--for example, nuclear energy and information technology--to draw attention to the fact that the establishment of investigative committees provided for in the enabling orders of the Bundestag in itself offers favorable conditions for predicting and assessing the consequences of technology in a way suitable to the Parliament.

Recommendations

The committee recommends to the Bundestag:

1. In the case of future decisions concerning the administrative and advisory capability of the Bundestag, to consider the present positive experience with investigative committees in technology-related fields and their administrative-scientific secretariats.

2. To enable the administration of the Bundestag to have personnel and financial means at its disposal as necessary to establish suitable administrative-scientific secretariats for investigative committees into technology-related fields on short notice.

3. To investigate how a direct introduction of the committee report into parliamentary proceedings can be achieved, if necessary, by amending the enabling orders.

4. Regulations Affected by the Committee's Recommendations

The application areas of genetic engineering affected by the committee's recommendations are already covered by numerous legal provisions. The following is a list of the more important provisions which are affected directly or indirectly by the committee's recommendations:

1. Statutes

--Law Governing the Manufacture and Prescription of Medicines

--Law on Foodstuffs and Commodities

--Law on Animal Feeds

--Federal Law on Epidemic Diseases

--Law on Animal Protection

--Law on Animal Epidemic Diseases

--Law for the Establishment of the Federal Health Service

--Civil Code

--Federal Law on Data Protection

--Law on Patents

--Law on Trademarks

--Law on Plant Protection

--Federal Law on Immission Protection

--Law on Garbage Removal

--Law on Waste Water Treatment

--Law on Industrial Safety

--Law on Transport Systems for Dangerous Goods

--Law on Chemicals

--Law on Equipment Safety

--Law on Removal of Animal Carcasses

--Code of Criminal Procedures

--Industrial Code

--National Insurance Code

--Code on Drinking Water

--Code on Disruptions

--Code on the Detrimental Effects of Waste Water

--Code on Workplaces

--Code on Work Materials

--Code on Pest Control

--Code on Protection Against Radiation

--Code on Materials Causing Water Pollution

2. Accident Prevention Regulations

--Qualification and Training of Personnel Working on Safety Workbenches

VBG 103/ Art. 2/DIN Standard 58956: Medical-Microbiological Laboratories

--Company Doctors VBG 123

--Industrial Medical Care VBG 100 (and Implementation Instructions)

--Health Service VBG 103

--Biotechnology VBG (proposal)

--Industrial Medical Care VBG 103

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FRG STUDIES COMPUTER APPLICATIONS OF OPTOELECTRONICS, NEUROBIOLOGY

BFMT Neural Computer Conference

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 451, 16 Mar 87 pp 5-6

[Text] The attempt to convert the knowledge of theoretical neurobiology into interdisciplinary joint research in new computer architectures could offer completely new horizons for information processing. With a view to determining the feasibility of such an attempt, a technical conference was organized by the BMFT [Federal Ministry for Research and Technology] on 5 and 6 March near Saarbruecken with about 40 international experts who reported on their work and objectives. Within the next 6 months, a working team is expected to devise a concrete research plan.

Currently available data processing depends on step by step detailed programming in which the programs run on a small number of very efficient processors connected to each other through a more or less rigid network. The [human] brain, in contrast, is made up of billions of "processors" composed of neurons and synapses, each one being remarkably limited in efficiency compared to computer processors. But the connecting network consisting of synapses is inordinately more efficient since it has the capability of self-organization. The performance and learning capacity of the brain is not attained through extensive serial programming of processors as is the case with data processing, but rather through the intelligent activation of a connecting structure directed toward each function to be carried out. In this way, nature clearly uses a data format for individual items of information which permits the parallel performance of billions of "processors."

The basic difference in working methods is one reason that while computers are undisputedly far superior to human beings in solving complicated calculation problems, notwithstanding the progress achieved in the last 10 years, computers are still way behind human efficiency in such fields as language and image recognition or in control of movement.

The conference of experts brought forward three basic fields which future research should aim at:

--elaboration of an appropriate data format for the quantity of individual items of data and their large-scale parallel processing;

--elaboration of self-organization mechanisms;

--development of specific processing procedures in neural architecture.

Application-oriented tasks presenting new solutions will be devised on the basis of these principles. Outstanding among these are:

--associative memories;

--language recognition;

--analysis of dynamic scenes;

--multisensory orientation in variable environments;

--robots in natural environments.

After a 5-year phase of basic research and evaluation of the results achieved, another equally long execution phase will follow with the purpose of demonstrating applications in the aforementioned fields.

GMD Mainframe for Parallel Processing

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 451, 16 Mar 87 pp 12-13

[Text] The Society for Mathematics and Data Processing (GMD) has acquired the MEGAFRAME parallel computer system from the new Aachen-based computer manufacturer, Parsytec. The GMD plans to use the system, in particular, for its theoretical and practical research in the field of parallel processing in computer systems, as well as for the wide application of this technology in graphics data processing and "artificial intelligence" systems.

Parallel processing is considered a key world technology because it overcomes the limitations of traditional computer systems for new applications. The GMD operates as a large federal research institution for data processing and information technology with about 1,000 researchers working on basic research in such key technologies. The GMD's SUPRENUM project, for example, involves the construction of a supercomputer for numerical applications, which will make German computer technology a world leader. To support such research projects, GMD is developing hardware and software models with the MEGAFRAME system, using Parsytec's particular experience in this field as well.

With the MEGAFRAME system, the Parsytec company is ready to manufacture design it developed based on the British "transputer" chips: Any number of processors can work individually on partial problems and communicate with each other as in an extremely fast telephone network. Virtually unlimited processing performance can be achieved by adding on more processor units.

The cooperation between the GMD and Parsytec gives an important impetus to future developments and validates the technical direction adopted, in which Parsytec is the world leader. For its future development, which is funded by the Federal Ministry for Research and Technology, this company, established in October 1985 at the Aachen Technology Center, has already stirred great interest in different industrial sectors. "As far as our future development is concerned," says Falk-D. Kuebler, doctor of engineering and general manager of Parsytec, "we are very optimistic. As a matter of fact, because of the great demand, we are expecting a strong growth in business and in the number of researchers."

Possibilities for Optical Computers

Duesseldorf VDI NACHRICHTEN in German No 9, 27 Feb 87 p 49

[Article by Egon Schmidt: "From Electron to Photon Computers: Nonlinear Optical Components Imitate Logic Gate Functions;" first paragraph is VDI NACHRICHTEN introduction]

[Excerpts] Munich, 27 Feb VDI-N--Today not only can efficient integrated electronic circuits be installed on small chips but also more and more sophisticated structures belonging to the field of "integrated optics." It is possible, at least in theory, to build computers with fine beam wave guides which work similarly to the traditional electronic ones yet at a much higher speed thanks to the use of light beams.

Chips for optical computers are basically made of an optically transparent substrate, for example, something like lithium-niobate, with thin bands where the light refraction index is a little higher than in the surrounding material. This enables the light projected onto the bands to be totally reflected at the interface and therefore to follow uniquely the path indicated by the channels integrated into the chips. If such a chip or light guide is exposed, for example, to an electric field, both the refraction index and the speed of light in the chip change, producing an "optoelectronic" effect with multiple applications.

This is the case, for example, in optical circuits with a lithium-niobate substrate where two beam wave guides run in parallel, very close to each other. In this case the beam may stay within its track or cross over to the other track according to the electrical field applied.

This kind of circuit as well as other optoelectronic components still belong to the field of "linear integrated optics," but the debate over the future of optical computers primarily concerns a different category of chips; namely, those which exploit nonlinear optical effects. Many experts believe that with these chips it will be possible to carry out typical computer circuit functions such as "AND," OR," or "NOT" functions.

In the case of linear optical effects, it has been noted that electrical fields lead to changes in the refraction index of an optically transparent material. Nonlinear experiments, on the other hand, are based on the

remarkable observation that in some cases the amplitude of light, that is, its intensity, may also change the refraction index. However, this effect can be obtained only by using a powerful light transmitting capacity which is only available from lasers.

Because of this effect it is possible to create a bistable optical component which allows impinging light of the same intensity to pass through or not depending on the sequence of the previous actions. What is most remarkable in this case is that electrical effects are no longer needed.

Several laboratories and institutes around the world are engaged in research to develop concrete structures of optical circuit components as well as technically optimal materials and design of optical computers. Although there is great diversity in this field, there is something which distinguishes optical "logic" from electronic models. It is the high level of "parallelism" achieved in data processing by using light beams, parallelism which makes optical computers stand out not least of all in the field of image processing. Several operations which electronic techniques can handle only in a sequential and therefore highly time-consuming way can be carried out in a single step using optical techniques.

Prof Dr Lohmann, chairman of the applied optics department at the University of Erlangen-Nuernberg, has undertaken research in this direction because he believes that elements borrowed from the interferometer principle not only may be helpful in the development of memories and logic gates, but may also lead to the solution of various problems concerning conventional electronics, such as charge carriers, "through the much more rapid photon technique."

According to Prof Lohmann, this is conceivable at least for the central parts of a computer in which electronic techniques would be replaced by photon components which operate "a thousand times faster" by using the principle of parallel data processing.

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CAD/CAM PROJECTS IN ESPRIT, BRITE, EUREKA OVERVIEWED

Paris REVUE DE PRESSE PRODUCTIQUE in French Jan 87 pp 1-3

[Reproduction of article from BUREAUX D'ETUDES AUTOMATISMES No 30, Dec 86 by Jean-Francois Preveraud: "CAD and European Programs"; first paragraph is source introduction]

[Text] Thus far development of CAD/CAM hardware and software has mainly been in American hands. Today, Europe is making a sustained effort with its large technology programs. Real programs for developing design tools are emerging.

Europe is something of a poor relation in high technologies, notably in computer development, both hardware and software. This is why several European technology programs have been launched in computer-related areas, research in CAD, which will be discussed here.

Connections Between CAD and Test Systems

ESPRIT has approved several CAD projects, notably under Theme 1 for advanced microelectronics and Theme 5 for computer-assisted manufacturing [CAM]. Project 97, directed by Belgium's University of Louvain, with the participation of Philips, Siemens, and Silval Lisco, aims at developing CAD tools for specialized VLSI circuits for signal processing.

The CATE project, involving Bull and GEC and Plessey of the UK, and assisted by the Universities of Duisbourg, Aachen, and Montpellier, has the task of designing a CAD system directly linked to VLSI circuit testing systems in order to design circuits which are much easier to test.

Within the EUREKA framework, the APEX project (advanced project for European information exchange) represents Europe's part in the development of the SET standards for exchange and transfer of graphic databases, created by Aerospatiale. This project, which could be opened to additional companies in the automotive sector, for example, will receive funding of Fr 200 million.

Still within EUREKA, the project conducted by Thomson and GEC (UK) for design and production of UHF electronic components using gallium arsenide focuses on components in particular and will necessitate development of specific CAD/CAM software.

Two other CIM projects about to be adopted by EUREKA have a bearing on CAD/CAM:

-One is the naval sector and includes IRCN [Research Institute for Naval Construction], Alsthom-Atlantique, ACN, and Normed for France, and seven FRG sphipbuilders.

-The other, a three-dimensional CAD/CAM project led by Matra Datavision and MBB [Messerschmitt-Boelkow-Blohm], is much less application-oriente. This project, lasting 3 years at a cost of Fr 40 million, will receive 79 percent of its financing from France. It was announced in June 1986 and little is known about it except that is was introduced as the beginning of a new generation of CAD/CAM tools.

A 3-Year Project

The BRITE program includes 13 CAD-related projects under Theme 5, called CAD/CAM and mathematical modeling. Among them is the development of 3-D codes for the design of processes involving non-Newtonian multiphase fluids in turbulence. This project involves only British and Netherlands companies. On the other hand, Merlin Gerin, together with an Italian company and a Belgian university, is working on a project for computer design and optimizing of circuit breaker boxes [chambres de coupure de disjoncteurs].

Mold Design and Automation

Telemecanique, together with Belgian and British universities, is working on digital simulation of injection molding and shrinkage estimates for use in CAD and in optimization of automation components. A CAD project in the furniture industry brings together Danish, Netherlands, and British manufacturers. Belgian and Luxembourg manufacturers want to introduce phenomena of instability and plasticity in a CAD project.

Another theme developed by Belgian, British, and German manufacturers deals with the design and optimization of mold manufacturing through the development, standardization, and integration of CAD/CAM procedures. France, through the companies RNUR [Renault State Monopoly], EDF [French Electricity Company], PSA [Pegeot], and CNAM [National Conservatory for the Arts and Professions], is collaborating with the British and Italians on 3-D mathematical modeling of drag around "bluff bodies." As for Bertin, it is working with the British and the Greeks to develop the application of Navier-Stokes' equations for gas turbine CAD.

The various programs can also be initiated by specific industrial sectors. This is the case with telecommunications, for example, where several agencies and manufacturers are jointly developing CAD for VLSI's for telecommunications in a project known as CVT. This 3-year project brings together 28 German, Italian, and French partners, working with a budget of 50 million ECU's, 50 percent EEC-funded.

A CAD System Connected to CNET

At a recent conference, an integrated CAD system was demonstrated whose tools were connected to the CNET [National Center for Telecommunications Studies] database. The design of a speech synthesis circuit made it possible to follow the circuit's description in the graphic input language with the Karl structural simulator, synthesis of control parts, generation of the layout plan [plan de masse] and of part of the implantation in 2-micron CMOS technology.

In addition to this complete application, 24 separate software packages were presented. Noteworthy were the demonstrations of the CNET's Cosmic VLSI database, the Italian telecommunication center's Adrianna layout plan, and the University of Darmstadt's Algic silicon compiler. Steps are already being taken in the three countries to refine the software packages for marketing.

Sycomore is a French project which unites Thomson, Bull, INRIA [National Institute for Research on Data Processing and Automation], and INPG [National Polytechnic Institute of Grenoble]. Begun in 1983, its goal is to develop a CAD system for creating ultra large scale integrated circuits (more than a million transistors per chip) within 5 years.

25060/12951
CSO: 3698/A177

BRIEFS

DORTMUND EXPERT SYSTEMS CENTER--Eight professors from Dortmund University have established the Dortmund Center for Expert Systems (ZED). They want to increase the practical applications of so-called expert systems and to promote training in this field. In particular, support to manufacturing technology and the service sector is envisaged. The members of the ZED want to make available on a regular basis to interested industrial and scientific parties the existing know-how on expert systems at Dortmund University. In view of the numerous possible practical applications it is obvious that expert systems have great commercial significance. Therefore, establishment of the ZED is regarded by its founders as a contribution to the structural changes in the Ruhr area. Companies located in this area will find in the immediate vicinity a research center that will provide support in the development and use of expert systems in a variety of industrial sectors. The center will provide ad hoc technology transfer and will cooperate with other interested scientists: "High Tech" is happening in North Rhine Westphalia. University professors from seven fields are cooperating in the center. The ZED is managed by the deputy vice-chancellor of the university, Prof Dr A. B. Cremers (data processing) along with Prof Dr K. H. Simmrock (chemical engineering) and Prof Dr D. K. Kurbel (commercial and social sciences). Mechanical engineering, civil engineering, statistics, and area planning are represented by professors R. Juenemann, K. Heinz, D. Hartmann, F. Eicker, and W. Roedding. [Excerpts] [Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 451, 16 Mar 87 pp 6-7] 8617/12955

CSO: 3698/M220

BMFT SUBSIDIZES PLASMA TECHNOLOGY RESEARCH FOR LASER APPLICATIONS

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 450, 26 Feb 87 pp 6-7

[Text] The controlled production of energy through nuclear fusion processes in extremely hot plasma is often referred to as "plasma physics" because for some 30 years the bulk of research funds available for plasma physics research has been spent on this long term challenge. This research policy has led to virtual abandonment of basic research in low-energy plasma physics despite the fact that, as G. Eckert, among others, demonstrated (On the Technological Potential of Plasma Physics, 1985, Technologie Aktuell No 5, VDI-Verlag), plasma physics has a high potential for important current technological applications. Let us examine just two of the many potential fields:

--Production of highly integrated electronic circuits, i.e., chips, by etching with high-frequency plasmas and the elimination of thin layers by plasma-chemical processes. This application envisages the use of low-pressure plasmas.

--The use of high-pressure plasmas as an active medium in noble gas-halogen-excimer lasers. Such lasers, which are simply called excimer lasers, represent the most intensive ultraviolet-light source available at present.

After years of efforts, a group of university professors has now succeeded in convincing the Federal Ministry for Research and Technology [BMFT] that a subsidy program for plasma technology is reasonable, necessary, and promising provided it finances not only medium-term technological development but also application-oriented long-term basic research. A joint study between the Institute of Plasma Physics of Hannover University, the Institute for Light Engineering of Karlsruhe University, and the Institute of Applied Physics in Darmstadt aims at gaining more knowledge on gas discharge physics in excimer lasers. The BMFT has allocated a DM1.1 million subsidy for the project.

Years of study on unsteady plasmas in shock-heated gases carried out by research teams of the University of Hannover's Institute of Plasma Physics under the supervision of W. Botticher and F. Demming provided an excellent start for the development of gas discharge physics in excimer lasers.

The pulse discharges are high pressure glow discharges and can be produced by maximum pulse lengths of a few microseconds. The gas used is a mix of noble gases with an addition of a small quantity of molecules containing halogen, e.g. hydrochloric acid or fluorine, with a total pressure of a few bars. In order to prevent sparks when igniting the structure, intensive pre-ionization is needed. We generate this with an x-ray tube with 10 megawatt pulse. This permits high volume homogeneous discharges (ours measure 2x2x20 cm3) in which the atom's kinetic energy, that is, the gas temperature, hardly increases, although the energy of the electrons corresponds to temperature levels of 20,000-50,000 K. This is typical of glow discharges and also a prerequisite for the laser's operation. Unfortunately, even after a homogeneous ignition, current contractions, called filaments, develop and produce sparks with a very high gas temperature. The question regarding the origins of such filaments, which interrupt the laser's activity, has only produced a series of basic assumptions but no theoretical model based on systematic measurements. The formation of filaments limits the duration of laser pulses and, consequently, their energy content. Without a basic understanding of these processes, predictions on both scaling up to high laser performances and improving lasers are impossible.

On 18 and 19 December 1986, by members of the three university research teams and by experts from the Lambda Physics and Kraftwerksunion companies took part in a seminar. Both companies are involved in a EUREKA project which aims at developing excimer lasers with extremely long duration performance for industrial applications. Basic research on high pressure glow discharges will probably provide useful knowledge for this technical application.

8703/12955
CSO: 3698/M204

THOMSON'S IC MANUFACTURING IN FRANCE EXPANDING

Paris INDUSTRIES ET TECHNIQUES in French 1 Mar 87 p 46

[Article signed J.F.C.: "Electronic Components: Production Cycle Reduced by One Week"; first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] In Maxeville, Thomson Semiconducteurs wants to outdo the Far Easterners. Thanks to automation. With a production rate of 10 million components a month, welding defects have been reduced to 500 parts per million.

Where is the best place to produce millions of components a month? In the Far East? Manpower is abundant and cheap. But charter costs and customs duties reduce the profits of such an operation. Moreover, in the Philippines, Malaysia, or Singapore, it is proving difficult to reduce the time needed for production and individual testing of components under 5 weeks.

Determined to reduce this cycle to less than a week, Thomson has opened a research and production center for integrated circuits at Maxeville near Nancy. The center was assigned three goals. First, to assemble and test 80 percent of Thomson Semiconducteurs' plastic package products: These include the standard bipolar integrated circuit packages of the Dual-in-Line Package (DIP) type, with a maximum of 24 outlets, as well as power components in 220 medium-wave packages with 5 or 7 external connections. Thomson is also preparing for assembly of MOS products and studying production of circuits adapted for surface mounting. Other goals are the design of new packages for these products and development of robotized transfer systems connecting automatic assembly and testing machines.

The factory, which opened in 1986, "has in 1 year reached a production capacity of 10 million components per month," explains Bernard Barban, its director. "The superstructures are designed for monthly production of 26 million pieces. Assembly occurs in a class-100 clean room. Testing takes place in class-10,000 conditions. Currently automated with Japanese OKI machines, assembly takes place in three steps. First, the chips are cut (by automatic slicing after circuit identification) and mounted on a support (that of the package) by thermosonic welding with gold wires 25 microns in diameter (or possibly ultrasonic welding with aluminium). Then comes molding, which takes 90 seconds per component. Five presses each have a capacity of 2 million pieces per month. Finally, assembly is followed by curing of the molded

resins. The pieces are taken from one machine to the next in cassettes handled by Puma robots. They go through a fully integrated tinning machine (fluxing dipping in a tin bath, cleaning) at a rate of 1,500 pieces per hour.

"Resin curing and polymerization time (up to 12 hours) limits productivity," stresses Barban. "But the appearance of quick curing resins (2 to 3 hours) will allow us to reduce the cycle to 1 to 1.5 days withing 2 years, compared to some 10 days at present." Then comes individual testing of the products, followed by visual inspection of the packages: first, checking with a flat laser beam, and then, image analysis by an Adcothec vision machine to locate and straighten the bent pins in components. Marking, the final step, currently is carried out by stamping, with each machine working at a rate of 6,000 pieces per hour. Laser marking is being considered for future use. Quality has not been forgotten.

"Our target for 1987 is to reach a total defect rate of less than 500 parts per million," explains B. Barban. There is daily sampling of products on the production line, aging of samples by 48 or 96 hours in heat chambers to simulate several thousand hours of operation, etc. "The rate of defects in wire welding is now lower than 10 parts per million; that of moisture penetration in the packages is under 0.1 percent after 2,000 hours. These rates match those of our American and Japanese competitors."

In addition to overall quality, they hope to acquire total flexibility of the production personnel: "Employees can run a robot as well as they do a tester," says B. Barban. "They are continuous trained for changes in production." The high qualifications required of our employees account for a non-negligible part (20-30 percent) of production costs, due to employee salaries. The viability of such a factory operating year-round, 24 hours a day and 7 days a week, will have to be demonstrated in the coming months. The Thomson group's most highly robotized factory... A factory which has required some Fr 300 million in investments, and which will require still more for automated machinery and robots, if production is to be more than doubled.

25061/12951
CSO: 3698/A174

EEC CONSIDERING ESTABLISHMENT OF HIGH-TECH INVESTMENT FUND

Amsterdam COMPUTABLE in Dutch 13 Feb 87 p 19

[Unattributed aritlce: "European Commission Requests Guarantees: Money To Guarantee High-Tech Projects"]

[Text] Brussels--The European Commission has requested the various member governments to give financial guarantees for a number of ambitious high-technology projects worth 2.5 billion ECU's (5.75 billion guilders).

The proposal is to form two ventures. One will administer investment capital of 500 million ECU's. This capital is to be used to acquire a 20-percent share in a number of fast growing (technology) firms. The second venture would serve as a guarantee fund for this investment venture and will require 100 million ECU's in capital.

International

The Commission's main problem in establishing this "Eurotech Insur" guarantee fund is the requirement for 100 million ECU's, which will weigh heavily on the already burdened budget. No money has yet been allocated in 1987.

The Commission informed the member countries that "it is particularly difficult to attract risk capital to a project based on international cooperation. The same is true of projects just entering the research phase and where the industrial product is still a long way off." Nevertheless, a great variety of research programs are still financed, at least partially, by the EEC. R&D is also being carried out in a broader context, the EUREKA project for example. Meanwhile, the private sector (finance companies) has committed itself to provide the Eurotech capital, some of which will be invested in the new high-technology projects. The Commission hopes that all the member governments will still accept the proposals this year. The commitments should be made before the governments have allotted their final budgets for 1988. The Commission considers the guarantee fund necessary because the project's investments carry greater risks than are usual for investment capital.

25044/12947
CSO: 3698/A172

BELGIUM PARTICIPATING IN FIVE NEW EUREKA PROJECTS

Brussels ATHENA in French Dec 86 p 42

[Excerpts] The EUREKA program, launched in April 1985 under French initiative, brings together 19 West European countries; its goal is to increase the productivity and competitiveness of Europe's national industries and economies in high technology.

At Stockholm on 17 December 1986, 37 new projects were adopted, including 5 either under Belgian direction or involving Belgian participation.

1. EU 78 Project

- Title: Development of rhizobacteria products for growth promotion and fungal disease in corn, sunflower, sugarbeet, soybean, and wheat.
- Budget and duration: 2.8 million ECU--5 years.
- Participants: Societe europeenne des semences (Tienen [Belgium]), project director; SES (Italy) and SES (Spain); Chemie-Linze (Austria); and Plant Genetic System (Ghent [Belgium]).

2. EU 6 Project

- Title: Eurolaser--Evaluation and development of industrial lasers for material processing in five main areas.
- Budget and duration: 83 million ECU--10 years. However, only the definition phase has been officially agreed upon.
- Participants: companies and research centers in the UK, the FRG, France, Spain, Denmark, and Austria. Representing Belgium: Compagnie Belge des Lasers.

3. EU 117 Project

- Title: Wollastonite reinforced engineering plastics.
- Budget and duration: 0.75 million ECU--2 years.
- Participants: Oy Partek AB (Finland) and Recticel (Wetteren [Belgium]).

4. EU 144 Project

- Title: ERTIS--European Road Transport Information Services.
- Budget and duration: 1.75 million ECU--3 years. Only the first phase has been officially agreed upon.
- Participants: NOB (Netherlands), project director; Datafreight (UK); FDE (Denmark); the National Belgian Federation of Goods Carriers; and Intermation.

5. EU 145 39 Project

- Title: Teleatlas.
- Budget and duration: 4.5 million ECU--4 years. Only the definition phase has been officially agreed upon.
- Participants: Teleatlas International (Netherlands), project director; ANWB (Netherlands); and for Belgium, the Vlaams Boekenfonds [Flemish Book Fund] and the Informatic and Management company (Ghent).

We should point out that a very well documented brochure giving all the pertinent information about the EUREKA program and projects has just been published by the Scientific Policy Planning Services. The main purpose of this document (Footnote) (Rue de la Science 8, 1040 Brussels. Tel: 320-41-00) is to provide guidelines to companies and institutes interested in learning about the mechanisms of this new form of European cooperation, whose goals are a priority of Belgium's research policy. In the meantime, the next step is up to business...also Walloon business.

25073/12379
CSO: 3698/A137

PHILIPS PRESIDENT PLANS THOROUGH REORGANIZATION

Amsterdam COMPUTABLE in Dutch 20 Feb 87 p 7

[Article: "More Influence for Product Divisions--Philips Plans Thorough Reorganization"]

[Text] Philips president C. van der Klugt plans a thorough reorganization of Philips' internal structure. The matrix structure will be abandoned and the departments responsible for the various product lines will be more independent, resembling independent companies.

With this reorganization Van der Klugt wants to strengthen the company's competitive position on the world market. In his opinion centrally organized production, a management structure consisting of fewer layers, and a more businesslike approach in internal dealings are needed.

Van der Klugt has also already repeatedly declared that Philips' profitability must increase. The company's current profit margin is about 1 percent, which Van der Klugt wants to raise to 3 to 4 percent. Nevertheless, 1986 will be a financially disappointing year: according to as yet unofficial figures, profits have fallen from 919 to 787 million guilders, while at the same time the company's turnover has gone down from 60 to approximately 55 billion guilders.

The study groups investigated the internal organization in 1986. A study group called "Standalone," under the direction of Vice President M. Kuilman, studied the independent divisions like Lighting and Medical Systems, while the "Interlinked" study group, under the chairmanship of Van der Klugt, investigated the more closely-connected divisions. In Europe, the reorganization will be carried out gradually, whereas in the United States it will be done "with the stroke of the pen," declared Van der Klugt in an interview with NRC HANDELSBLAD. In Europe a transitional arrangement of, for example, 5 years is being considered.

Van der Klugt also recently suggested closing down non-essential divisions. The objective is to increase profitability and to concentrate all available resources on important product lines. It has not yet been revealed which divisions are involved.

25039/12947
CSO: 1698/A159

BRIEFS

DEGUSSA RESEARCH FUNDS INCREASE--Between 1985 and 1986 Degussa AG's research expenditures increased from DM190 million to DM223 million. The company now has 1,852 employees working in this sector. This information was supplied by Degussa AG in its 1985-86 annual report. According to the report, metals research focuses on the fields of noble metal cutting and preparations, powder metallurgy, dental materials, galvanizing technology, and sensor systems. Activity has increased considerably in the electronic materials sector. Chemical research--increasingly devoted to the development of future-oriented themes--dealt with, among other things, the production of monosilane and extra pure pyrogenic silicic acid, the development of diesel filters equipped with catalytic convertors for the purification of exhaust gas; and the optimization of production processes for amino acids, amino acid-based materials, and peptides. Research efforts were also increased in the pharmaceuticals sector. According to Degussa, basic research covers interesting developmental substances with anti-allergenic, analgesic, and positive intropic effects which also inhibits breast cancer. [Text] [Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 451, 16 Mar 87 pp 14-15] 8701

/12951
CSO: 3698/M223

BRIEFS

FINNISH-RUSSIAN IBM CLONE--The USSR will soon announce an IBM PC clone for use in Russian computerization projects. By the end of 1987 the ES-1840 personal computer will be manufactured at three different locations in the USSR. A Finnish-Russian joint venture, Elorg Data, will export the Russian clone. At the same time the Russians will start the manufacture of a multiuser system based on the 80286 chip and called the SM-1810, as well as a DEC-like minicomputer, the PDP-11. [Text] [Amsterdam COMPUTERWORLD in Dutch 3 Feb 87 p 25] 25055

12951
CSO: 3698/A139

HUNGARY: DATABASE FOR RADIATION PROTECTION

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 6, 25 Mar 87 p 26

[Article by Marton Vargha: "Radiation Protection Database"]

[Text] Since Chernobyl there is probably no one in Hungary who does not know that we also have a National Radiobiology and Radiation Health Research Institute named for Frederic Joliot-Curie. But few know that in this institute the Computer Technology and Measurement Technology Department operates a central data processing system for radiation protection around the Paks nuclear power plant.

The computer center is in a new building beside the main building of the institute--the Torley Castle in Budafok. The central computer is an SZM-4. Here they record, evaluate and analyze data from a radiation observation network located in the 30 kilometer zone of the Paks nuclear power plant.

The results of measurements done independently by the Paks Nuclear Power Plant Enterprise and by institutions under the supervision of a number of chief authorities--the Ministry of Health, the National Environment and Nature Protection Office, the Ministry of Agriculture and Food and the Water Affairs Office--arrive continuously at the computer center. In the course of data collection they test the radioactive concentration of the Danube water above and below Paks, the concentration of radioactive isotopes released into the air by the power plant, environmental radiation, radiation of the soil and the radioactivity of grass, green fodder, drinking water, milk and meat. Data sheets for on-site and laboratory measurements are filled out at the test locations and then are sent to the Radiobiology Institute.

After recording and checking the data go into the database, which is queried for monthly, quarterly, semiannual and annual reports. The chief task of the system is to track the radiating isotopes released by the power plant into the environment under normal operating conditions. Since a fairly long time, 2-3 weeks, elapses between taking a sample and getting the data into the database this system is not suitable for swift recognition of larger irregularities, but the combined study of many types of data from a large area provides an opportunity for discovery of emission trends and periodic changes in distribution.

By comparing the reports of independently working measurement sites the program system calls attention to deviations which might be caused by measurement technology differences, clerical errors which might slip through the data checking or a wrong setting of an instrument. With an analytical program they can also continually estimate the radiation dosage of workers and residents around the power plant.

The experts of the Radiobiology Institute and of base institutes participating in the study analyze the tables and graphs produced by the query programs and their conclusions go into the regular reports.

The data, collected over 3 years, can be studied from many viewpoints with statistical and other mathematical methods, but the capacity of the SZM 4 computer is already too little for this. "Therefore," said Bela Kanyar, chief of the Computer Technology Department, "we are establishing a direct link over a data transmission line with the HwB 66/20D computer of the State Administration Computer Service."

The link with the ASZSZ [State Administration Computer Service] is given special significance by the fact that the national environmental protection databases of the OKTH [National Environment and Nature Protection Office] and of the Environment Protection Institute have been located there also so it is possible to have a complex analysis of radiation contamination and other environmental contamination.

The SZM 4 is not the only computer of the institute. In the department they also study the presence and concentration of radioactive isotopes in various materials, and even in humans. The signals coming from the detectors sensing gamma radiation go to a special purpose computer in which they look for the peaks characterizing the several isotopes with spectrim analysis programs. In the photographs one can see such a spectrum analyzer, of Canberra manufacture, and a spectrum analyzer connected to a portable detector suitable for field measurements.

There are also isotopes characterized by alpha, rather than gamma, radiation. Measuring these is much more difficult because it is easily absorbed. The Institute recently obtained equipment--again a Canberra product--to detect such isotopes.

Every minute counts in the event of a radioactive catastrophe; every minute of delay endangers the lives and health of hundreds of people. So it is very important in such cases that it be possible to estimate as well as possible what can be expected where half an hour after the accident, an hour after, and so forth.

To develop models suitable for this one needs information about the environmental movement of so-called radionuclides and other indicating materials and their concentration in living organisms. A work group formed in February 1986 with the participation of Japan and a number of European countries, Biospheric Model Validation Study (BIOMOVS), is summarizing comparisons and evaluation of procedures serving to calculate such things. The goal of the methodological work group is to study the precision of

mathematical models used to predict the concentration of a few selected contaminating materials, to discover deviations caused by the input data selected, by faulty presuppositions or by structural deficiencies and to develop proposals pertaining to future research aimed at increasing the precision of the predictions.

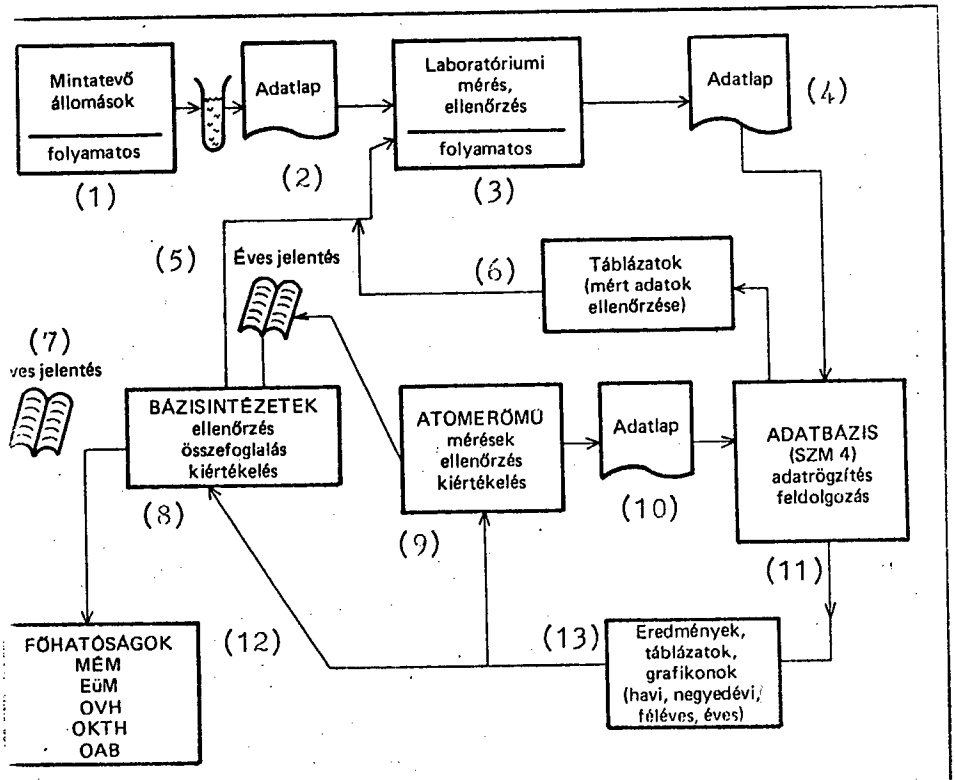
The Radiobiology Institute also has joined in the work and at the conference last fall great interest was shown in their talk on a compartment model using differential equations with which the path of isotopes can be studied in the food chain.

In addition to recording and analyzing the environmental radiation burden the computer center also supports with statistical analyses and methodological advice the research taking place in the other departments of the institute.

For example, in cooperation with the isotope use department they adapted a mathematical-statistical program system with which they evaluate so-called radioimmunoassay measurements. With this method, using isotope indicators in living organisms, they can show the presence of compounds in very small concentrations.

Observing damage and destruction taking place in cell populations is a tool suitable for measuring individual radiation damage. In cooperation with the radiotoxicology department and the radiation diagnostic laboratory they are seeking mathematical models to describe the link between radiation dose and cell destruction. On the basis of a proven precise model they could deduce the radiation dose affecting the cells from the destruction.

Figure: Computer Processing of Data From the Radiation Protection Control System



A sugárvédelmi ellenőrző rendszer adatainak számítógépes feldolgozása

Key:

1. Sampling stations, continuous
2. Data sheet
3. Laboratory measurement and checking, continuous
4. Data sheet
5. Annual report
6. Tables (checking measured data)
7. Annual report
8. BASE INSTITUTES, checking, summation, evaluation
9. NUCLEAR POWER PLANT, measurements, checking, evaluation
10. Data sheet
11. DATABASE (SZM 4), data recording, processing
12. CHIEF AUTHORITIES, Ministry of Agriculture and Food, Ministry of Health, National Water Affairs Office, National Environment and Nature Protection Office, National Atomic Energy Committee
13. Results, tables, graphs (monthly, quarterly, semiannual, annual)

8984
CSO: 2502/53

HUNGARY: NO MARKET FOR DOMESTICALLY ASSEMBLED COMPUTERS

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 6, 25 Mar 87 p 9

[Interview with Mihaly Sandory by Tamas Kolossa: "But There Is No Market!"]

[Text] Mihaly Sandory, former government commissioner for the microelectronics program and retired director general of the Microelectronics Enterprise, views the events taking place on the PPC market in their broader interdependencies. For this reason we asked his opinion about them.

[Answer] I am quite alone with my views. In my opinion the hysteria surrounding PPC manufacture can be attributed to the fact that the Hungarian electronics industry was not assigned appropriate tasks in the course of plan harmonization. Significant free capacity remained. At the same time the small undertakings easily assemble subassemblies and computers even with their initial capital. If we study the consequences of this at the macro-economic level, from the viewpoint of efficiency, it turns out that the manufacture of personal computers is taking place in a self-destructive way.

When we began to manufacture the TPA computers at the KFKI [Central Physics Research Institute] we knew that we would have to pay more dollars for parts than for a finished machine. But at that time it was not possible to buy a finished machine. Today the situation is different. Personal computers could be purchased under favorable conditions. But instead we see the small manufacturers, and so we still pay a good bit more than necessary.

The situation is the same as if we tried to help a shortage of passenger cars by buying parts. And not good, tested parts but rather as if we were buying parts which proved to be scrap for foreign manufacturers, which are worth fixing only here.

[Question] To what extent do you consider this the general practice today?

[Answer] Would it be worth tracking down the structure of import? In the West, on the spot, the Hungarian small cooperatives can get faulty cards thrown out by the manufacturers for a song, as cheap goods. And the Hungarian engineers repair them. This would be all right in a way if those engineers were inclined to live at the level which goes with such work on the world market. But the rational solution is if they do good level work at an appropriate standard of

living. I must add that a balance at the national economic level would show that what a Hungarian engineer in a small cooperative gets as pay and what he buys with it, 50-60 percent of it also costs capitalist foreign exchange. Partly because heating and overhead contain foreign exchange--at the national level--and partly because industry and agriculture lack engineers and for this reason among others it is hard to produce the wheat and bread consumed here with a competitive dollar multiplier and finally the apparent profit of barter deals simply takes away dollars. An example. Let us presume that Hungarian powdered eggs cannot be sold well for dollars--at a profit. If the Hungarian party gets a computer for the powdered eggs he can amply cover his loss out of the difference between the foreign market price and the price here at home. But this loss--as in the case of overhead--appears in another branch. In principle, in the wake of a valid resolution, finished computers cannot come in, but in the meantime, probably, a number of channels similar to the one above remain open. The problem can be solved with less loss only if we were to buy with the foreign exchange turned to parts acquisition and amateur level assembly a good many more computers than can be produced in that way.

The larger part of the work turned to a personal computer begins after it is sold. The domestic engineers should deal with this, independent of enterprise size. They should be dealing with development, interfacing, network building and service.

[Question] As I understand it competition on the domestic PPC market is taking place in these areas too....

[Answer] In the first place this competition is taking place without proper tools, training or aptitude, at an amateur level, and so it is expensive. In the second place I would not call the domestic manufacture of and trade in personal computers a market. The majority of the decision makers and advisers have still not sat down to a keyboard. They see only the momentary economic interests of the enterprises affected, but the technical result and the long-range solution following from this have been lost. As long as an activity depends on resolutions we can talk only about undertakings existing in different situations, and not about a market. That contest should have been announced completely openly, to foreigners as well. Despite this I am an optimist, because the potential big professional users--State Insurance, the banks, the National Plan Office, etc.--will see to it that they can get good machines. They have to calculate not only with the purchase price but also with maintenance and operation, so the cost difference can be measured. The comparisons will show what bad business it is to have engineers doing the soldering.

[Question] Why cannot the large domestic manufacturing enterprises bring their weight to bear?

[Answer] The competition is manufacturing in series of 500,000 units per year. Simply for technical reasons one cannot realize world level manufacture of a series smaller by orders of magnitude. There is a real possibility of production cooperation with large firms; this is what Hungarian manufacturers might be interested in too.

[Question] So in your opinion it is not worthwhile to manufacture personal computers here at home, we could use the money which might be turned to this to buy large orders, more cheaply in every respect. Only one question remains, the danger of being at the mercy of others and the backwardness of domestic parts manufacture and domestic research and development work....

[Answer] In the case of computers there is a buyer's market in the world, it is the producers who are at the mercy of the customers. On the parts market there are places where we are at the mercy of others. This means that our chances are better in obtaining computers, because every government and manufacturer must reckon with a PPC market the size of Hungary's, several thousand per year. But we are more vulnerable in parts acquisition, because the Western manufacturers could more easily interrupt their parts export to us. And this confirms what has been said.

8984
CSO: 2502/53

HUNGARY: SOFTWARE EXPORTS IN 1986

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 6, 25 Mar 87 p 9

[Article by Gitta Takacs: "Our Last Year's Software Export"]

[Text] Studying the development of statistics pertaining to the convertible accounting software export of recent years (see COMPUTERWORLD/SZAMITASTECHNIKA No 4, 1986) we can establish that the increase is about 30-40 percent year after year. So, knowing the income data for 1985--approximately 8 million dollars--we might also have predicted the 1986 income--last year we exported 12,544,000 dollars worth of software. (We cannot regard the increase as 50 percent because we have to consider also that the majority of Hungarian software business was done in West German marks which went up in value last year compared to the dollar and the devaluation of the forint in the fall also had an effect on the numerical development of income counted in dollars.)

In any case it is also probable that software export was somewhat more than this; for example, a difference could derive from the fact that at the time of collecting the foreign trade data the trade of some enterprises was recorded according to the Industrial Product Registry, so some computer technology organizational work done within the framework of some investment, construction, etc. prime contracting and some software delivered remains "hidden." Nor does the above sum include software export conducted through the Authors' Legal Protection Office or the TESCO [Technical-Scientific Cooperation Office].

The 12.5 million dollar turnover was "brought together" by 15 foreign trade enterprises and firms with independent export rights with the "division of labor" shown in the first table.

The second table shows the shares of our most important software exporting institutions, reflecting also a phenomenon of recent years, that a good number of highly qualified experts with good contacts and experience in export work have left the large software houses which have long been working for customers abroad and are continuing their work--under substantially more profitable conditions--in small cooperatives.

Exporter	Value of Export (1,000 dollars)
Metrimpex	7,194
Interag Rt. (joint stock company)	2,308
Comporgan	910
Budavox	418
Videoton	380
Novotrade Rt.	350
Realco Small Cooperative	348
Intercoop	331
Technoinform	85
Duna-Majna Kft. (Danube-Main Ltd.)	77
Transinvest	53
Technoimpex	48
Hungarotex	26
Akadimpex	13
Elektromodul	4

Institution	Value of Export (1,000 dollars)
SZKI-SCI-L *	2,000
SZAMALK **	1,650
Comporgan	910
Budata Small Cooperative	500
Softcoop Small Cooperative	400
Videoton	380
Novotrade Rt.	350
Realco Small Cooperative	348
ASZSZ ***	300
Graphisoft Small Cooperative	300
SZUV ****	200
Instrument Technology Small Cooperative	100

* Computer Technology Informatics Development Subsidiary of the Computer Technology Research Institute
** Computer Technology Applications Enterprise
*** State Administration Computer Service
**** Computer Technology and Management Organization Enterprise

It is significant that Novotrade and Graphisoft earned income exclusively from program products and license fees. (It is well known in professional circles that in the majority of deals "software export" is really the "export of software people", that is, it means providing experts for software development projects performed abroad.)

The 12.5 million dollar income of last year can be estimated as one year's work by about 400-450 software development experts. According to foreign trade experts this turnover could be increased several times by making the branch more organized and making foreign trade regulation more favorable, and if there were more foreign trade people who understood this special area and more highly trained software people who spoke foreign languages well. Naturally, the sale of program products would mean the greatest profit for the national economy, but for the time being we do not have a lot of software which is competitive on the convertible market.

8984
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HUNGARY: SEMINAR ON TELETEX, VIDEOTEX

Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian No 6, 25 Mar 87 pp 24,25

[Article by Huba Bruckner: "A Telematics Panorama Hungarian Style--'We will have butter on our bread and maybe honey too, but first we need some bread'"]

[Text] Ten ardent believers in telematics described their achievements, experiences and problems at a seminar organized by the NJSZT [Janos Neumann Computer Science Society] and the MTA [Hungarian Academy of Sciences]. The organizers wanted to direct attention to state administrative applications, but everyone who has done or wants to do something in the area of video newspapers or conversational videotex had a say. The announced goal of the program was to "bring developmental problems to the surface" and this could hardly have been done at a better time for those present included representatives of the Hungarian Post Office, the OMFB [National Technical Development Committee] and a few domestic manufacturers. So everyone was together who could ask or be asked of.

We actually expected a much more passionate debate. Public videotex is still awaited; it is a problem that the domestic systems in existence use the Prestel display but the Post Office plans introduction of CEPT; there is not even any report of domestically made CEPT terminals; the telephone problems are so well known as to be boring; and although they want to expand the video newspaper the problem of accented letters is still (or even more) unsolved. It makes a difference whether everyone who saw teletext was "happy" or "crazy" [two Hungarian words which are the same except for the accent marks]. Or is a person exempt from spelling if he watches the video newspaper? And the manufacturer of the teletext character generator would have undertaken, free of charge, to develop a circuit corresponding to Hungarian orthography.

Of course, we need not feel ashamed. We recognized the blessings of telematics early on, or at least of video graphics. An OMFB study titled "Technical and User Possibilities of a TV Information System" appeared in 1978. It summarized the European situation which had developed up to September 1977, listed domestic use possibilities and made proposals pertaining to technical studies preceding introduction. We can read in the introduction to the study:

"Teletext and the Viewdata (later christened Prestel) videotex service are new ways to communicate information so we are not backward in this area yet. In

the interest of seeing that backwardness does not develop and that Hungary can keep up with the development of systems the technical and economic problems of use should be made the subject of a penetrating study...."

This happened. The theme was dealt with in two studies in 1980. But in the anniversary tenth year we still cannot brag of a public videotex system. The OMFB did act in time, but today the situation must be characterized by such statements as: "The ideas in the studies are good, but the time limits have slipped greatly"; "The situation is not free of contradictions"; and, unfortunately, "There is a great lack of coordination."

The OMFB also supported materially the development of several in-house--closed circuit--videotex systems, but as we know the requesters did not exploit even half of the possibilities. Maybe they didn't even know about the possibilities?

The restricted capacity of the telephone network is far from being the only cause of the lack of public videotex. That is only the tip of the iceberg (as we know, 90 percent of the iceberg is under water so it cannot be seen!). Something must be done about terminal manufacture, we need suitable capacity computers and storage and useful, that is interesting, videotex databases, regular file maintenance must be solved, we must build up the hunger for information--in brief, there must be an informatics culture and infrastructure. It might be interesting to muse on a thought experiment, what it would be like if overnight a good fairy were to create a "piped network," let us say a 500 terminal CEPT videotex system, with everyone making use of a service offering uninterrupted transmission for the price of a local call. To what extent and with what would the "inexhaustible" storage be filled? What would the traffic parameters show one year after the miracle? But we need not experiment (not even in thought), let us look at reality.

We have heard that the OMFB considers it necessary to review the whole situation after starting up the experimental services supported bythem, and considers it important to handle closed circuit and public videotex according to a uniform view. Also according to them there will be big problems with development even if they continue telematics support in the Seventh 5-Year Plan. Although not as rich as Croesus they will put butter on the bread, maybe even honey, but first there has to be some bread! They appeal to the collective wisdom, beginning with selection of developed systems all the way to a rational solution of terminal manufacture.

Very good, but who will begin to manufacture terminals, when and according to which standard? And if somebody is already working with CEPT can he hope for some support?

The postal opinion is unambiguous regarding the standard. Today one can only choose the CEPT standard for a public videotex system. For our part we completely agree with their position. It is modern, it solves the problems connected with the Hungarian alphabet, it makes cooperation with many European countries possible, it has prospects, etc. It is not by chance that the FRG and Austria also switched to CEPT even at the price of having several thousand terminals become obsolete at the time of the system change. Here

(fortunately?) this is not the situation, not one public terminal is in operation yet, although the terminals of the closed circuit systems all use the Prestel system. So, how many such terminals are there? One hundred, maybe 200, hardly more than this. And how many videotex pages will have to be changed because of a conversion? But the later the decision the more terminals there will be (we hope) and the more pages there will be and uncertainty will grow all the more in the ardent operators of existing systems and, of course, among the device manufacturers.

Even today the CEPT decoder is more expensive than the Prestel type, the advantages have a price. But can we expect that the day after tomorrow they will manufacture circuits, already outmoded by then, just for us (and the technical museums)?

We should not chide the Post Office in regard to the system switch. It may appear that in certain respects they have chosen a path which is more difficult today, but it can be taken as certain that this path leads farther. But those affected must be informed as soon as possible of the decision and of what comes next. Let us not forget that the number affected is not small. And it must be clarified how the existing closed systems can be connected into the future public videotex network. (They were thinking about them too when compiling the requirements for the public videotex system.)

In the eyes of the Post Office, as the provider of data transmission, videotex is only one of the things provided (pardon, services). Their networks must handle telex, teletex, data transmission and image transmission on domestic and international scales. Throughout the world today there are more than 2 million telex stations in operation and one can call the stations of a good bit more than 100 countries from our country. The domestic device inventory for teletex, appearing as the modern successor to telex, is still undeveloped--teletex provides transmission from storage to storage. The price of one set is about 11,000 West German marks, but we must provide these from domestic sources too. The number of teletex terminals in the FRG is around 20,000 today and that of telefax stations also suitable for image transmission is already nearly 30,000 there. Their number is far smaller here but unfortunately the public document forwarding possibility which can be used for very advantageous fees is still unexploited.

Of course the Post Office has and will have plenty to do. There are things which require much money and things which require virtually nothing--such as providing information. We already have a line switched data transmission network, but its capacity is a drop in the ocean. We will have a packet switched network too; it will be experimental, so let us not dwell on its capacity. There will be videotex too. Who knows when? Are videotex databases being built anywhere? Will there be gates for the gateways? Will the fee pulses interfere with data transmission? And let us put on the old record although that groove is already worn out: Where do we stand in telephone matters?

The representatives of the Post Office were right, the field of Arpad is not France; we should not expect the number of videotex terminals to jump to millions overnight, nor should we believe that we can repeat the French

telephone miracle, mentioned with wonder throughout the world. Goulash will not become Dubarry salad overnight, but we should pay attention to Paris if deliberate informatics-telematic developments are under discussion.

The existing and planned telematic services (primarily a video newspaper and conversational videotex) shown at the seminar presented a mixed picture. One thing is certain, no one said, Thanks, I've had enough. Indeed, optimism and enthusiasm were what was characteristic. But he who struggles day after day with hardware and software failures, who is happy if at least one day in a week he can make contact with his terminal partner in the provinces, and who even has to struggle to get the information to put into the system and who sees that however carefully he loads the sausage filler the the information is rather rarely tasted, only he can truly know that telematics here is not yet a pig-killing feast.

8984
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PRODUCTION, EXPORT OF ROMANIAN SOFTWARE

Bucharest, REVISTA ECONOMICA in Romanian No 51, 19 Dec 86 pp 12-15

[Article by Theodor Purcarea: "The Software Industry, Respected Manufacturer and Exporter"]

[Text] In the opinion of futurologists and others, the threshold of the third millennium will be marked by the emergence of a redoubtable force indispensable to technical progress in any sector of economic life. Provisionally called "ultratechnology," it combines into complex structures the peak accomplishments in the area of semiconductors, communications, and data processing. It will represent the technical and material basis of the information society of the future.

The development which data processing has undergone in Romania over the last 20 years, in both the hardware and the software sectors, now gives this sector of the economy numerous priorities in applied electronics for cybernetization of process and management control, scientific research, development, medicine, and services. At the same time, the software industry has grown, through intensive design and development work, and software is now capable of directing machines to execute the most refined and elaborate algorithms. In what follows we discuss some of the aspects of the institution which acts as coordinating agency in this area, the Research Institute for Computer and Data Processing Technology.

The Research Institute for Computer and Data Processing Technology (ITCI) coordinates research on creation of hardware and software at the level of the most modern technologies and architectures and on development of basic software and applications fully utilizing the potential of the Romanian electronics industry.

Following the instructions of the secretary general, Comrade Nicolae Ceausescu, to make products that are competitive worldwide, ITCI has concentrated its research efforts on technical engineering solutions which have proved to be efficient in the national economy and on the foreign market in international commercial competition.

Deriving the benefit of experience accumulated in more than 15 years of fruitful research in the area of computer technology and data processing, the institute can now offer users both particular solutions to highly specific problems and complex turnkey systems over a broad spectrum of applications.

In the area of basic software, operating systems, compilers, and data base management systems, the results obtained for a wide variety of computer configurations (medium-sized, mini, micro) attest to the high professionalism of the developers. The unified way in which they have been conceived, along with the considerations of compatibility with similar systems developed by other firms, permits the creation of computer networks facilitating the development of complex applications such as distributed data base management systems, remote detection systems, and real-time process control systems.

Designed and implemented in a portable design, the applications software can be installed with minimum change in the most widely varying hardware configurations without in any way reducing system performance. Among the turnkey systems delivered in countries with a tradition in the area of computer development and utilization, mention may be made of the PIX system for automated design of printed circuit boards (comparable in functionality and performance to the REDAC system developed in Great Britain), the ISOLDA for design work in the machine industry (comparable to the MEDUSA system in the United States), the ARTIS system for design work in the field of architecture, and the WIPS system for receiving and processing the data transmitted by geostationary and migratory weather satellites.

Needless to say, the systems in question represent only part of the results of ITCI's interdisciplinary efforts. In point of fact, data processing solutions can be evolved for the majority of the problems which are algorithmizable or susceptible to automation to a significant extent. Being a software house for which the quality attribute is a fundamental criterion, the institute also offers qualified services on demand to any potential user with solutions tailored to the specifications imposed.

The viability of the research trends and of the solutions provided is proved by the success of the systems indicated above in exports of Romanian computer technology. The turnkey systems developed by ITCI together with Romanian electronics and computer industry enterprises are to be found in a great variety of enterprises of our trading partners. In many cases the Romanian software and hardware products have been their own advertising, in that a single system sold to a customer in later years attracts requests from new users, who derive their information directly from the first user. Training of personnel for the systems which we implement is conducted by instructors of high professional competence at a special customer training center outfitted with the latest equipment made by the Romanian computer industry.

International Economic Cooperation in Numerous Forms

The upsurge in development of computer and data processing technology would be inconceivable without the context created by participation in international collaboration. The general economic progress of each country in this context represents the immediate result of the international division of labor, including that in the priority sectors of technical and scientific progress. The cooperative relations among the various countries are given expression both in the sphere of technical and scientific research and in that of material production and exchange of equipment. From the viewpoint of the area of cooperation, it is conducted on both a bilateral and a multilateral basis. Economic and technical-scientific collaboration is conducted multilaterally

within the framework of an international economic organization, the Intergovernmental Collaboration Commission of the CEMA member countries in the sphere of computer technology, and in the context of the interacademic relations of the CEMA member countries through the Coordinating Council for Computers and Data Processing.

The activities conducted within the framework of the Intergovernmental Commission in the sphere of computer technology are oriented in the following directions: coordination of technical and scientific collaboration, organization of cooperation and specialization in production, and preparation of conditions for conduct of trade.

On the basis of the joint efforts of the Intergovernmental Commission member countries, a large number of items of equipment and programming resources (basic and applications software) have been developed for the unified series of minicomputers and microcomputers (SMC) and for medium to large productivity computers (SUMEC). The multilateral cooperation agreements on development, specialization, and cooperation in production within the framework of the Intergovernmental Commission ensure a suitable framework for mutual exchange of computer equipment and software products.

The Romanian participation in the activities of this international organization has been expressed specifically in development of several types of professional personal computers, the M216, CUB, FELIX PC, aMIC, PRAE, etc, the I 102 and I 106 minicomputers, peripherals, and basic and applications software for this equipment. Some of this equipment is offered as Romanian computer exports.

Joint efforts exerted through academic institutions are aimed at execution of fundamental research projects. They involve cooperation in carrying out complex scientific projects for the purpose of developing new generations of computers and solving basic computer technology and data processing problems.

The activities in international cooperation within this framework under the 1986-1990 5-year plan have the aim primarily of reaching objectives in the directions of electronics applications and complex automation of the Integrated Program of Technical and Scientific Progress of the CEMA member countries to the year 2000.

Bilateral joint efforts are aimed at creating equipment and basic and applications software programs capable of solving problems in various sectors of the national economies of the respective countries.

Computer Efficiency becomes Feasible Only with Software

Application of the program for improving the economic and social information system, the introduction of control by automatic data processing means, and provision of computer equipment for the national economy have allowed the development of significant electronic computing capabilities distributed both geographically (regional computer centers) and among sectors (departmental computer centers of centrals and enterprises). Outfitting these centers with modern Romanian-made equipment has enabled the development of a very wide range of applications specific both to the economic sectors and to other sectors of the life of society.

The National Software Program Library has been created to accomplish transfer of know-how within the national economy and to afford an overall picture of production of data processing programs. At the same time, it provides a solid base for discussion for the purpose of expanding interational disucssion in the area of basic and applications software program packages. An effort is made to identify and list similar programs offered by other firms in software export catalogs, so as to achieve better communication with foreign partners. Owners of Romanian computer systems are especially interested in acquiring new software packages elaborated by ITCI and other suppliers in the economy. In this way they can enhance the importance of industrial systems and fields of application.

A superior way of meeting the requirements of foreign partners is represented by marketing of problem-oriented systems, termed turnkey systems in international commercial practice. They combine system analysis for a particular application, basic and applications software performing a specific function or set of functions, implementation and customer training, and the necessary hardward if required (on demand).

Taken over from international machine trade practice, the marketing of integrated systems performing a specific function, with specific technical parameters, is found to be an efficient form not only in export of data processing services (in the broad sense of the term) but also in equipment export. The Computer Technology and Data Processing Institute currently exports software for CAD/CAM (computer aided design/computer aided manufacturing) microcomputer systems through the Electronum foreign trade enterprise.

In the first category, CAD, mention may be made of the following:

The PIX system (a CAD system for printed circuit board design and generation of automated manufacturing systems). This system is in use in many Romanian electronics industry enterprises (the Peripheral Equipment Enterprise, the Electromagnetica enterprise, the Electronica enterprise, and also in the ICSIT-E, ICSIT-TCI, IPA, and IFIN). In addition, 12 PIX systems have been installed in the GDR, the FRG, and Austria; they contribute to better utilization of minicomputers, diagram displays, and Romanian-made DAFs.

The demand for them on the foreign market is explained by their outstanding performance. They more than cut in half the time required for designing a circuit board, while improving the quality of the product, correspondingly reduce the labor consumed in design and in production, are marked by especially great portability, they being easy to install, they can easily be adapted to widely varying makes of hardware, and quality training and servicing are provided.

The group of CAD systems also includes ISOLDA, a compact software system for automated design in the machinebuilding industry; BUILD STAR, an integrated graphics system for design in construction, architecture, and area development; SPRING, a modular program package designed for graphic simulation of phenomena in research and development, optics, robotics, ergonomy, and instruction; ARTIS, an automated design system in architecture with technological and dimensional restrictions allowing intervention by the

architect in selection of the optimum location and dimensioning alternatives. Similarly, in journalism and educational applications use may be made of CADIX, an interactive graphic system for automated design in 2 and 3 dimensions and for programming program-controlled machine tools.

Systems designed to perform other functions include SIEBDT, an interactive production process development system applied in light industry; RUDOS, a software system for radiation diagnosis and treatment; U, an operating system for microsystems equivalent in functions to the AT&T system (Unix); CARUSEL, a hardware system for spectral analysis used in metallurgy, biochemistry, etc; u-CROSS, a system for networking several computers which is capable of performing operations connected with reading files situated great distances away and other operations, including electronic post office functions; RECOL, a relational data base management system functioning as a completely integrated information dictionary for expressing the correlation among data, including those used in accounting; and PRAG, a software system used in research and medicine for gamma ray analysis and data storage.

On the basis of the software systems developed thus far, ITCI intends to begin export marketing of computer networks meeting international standards, such as the NET x 25 and CAMELEON. Another current activity is diversification of the mix of systems (hardware plus software) designed for computer aided instruction based on standardized equipment. The intensive research activity in progress in the Bucharest industrial area and at ICSIT-TCI branches around the country and the close cooperation between institutes of higher education and regional computer centers ensure reliable preconditions for stepping up the pace of technical progress and for developing information systems marked by ever higher performance and greater intelligence.

6115
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AUTOMATION OF GDR INDUSTRIAL PRODUCTION

Warsaw PRZEGLAD TECHNICZNY in Polish No 47, 16 Nov 86 pp 26-27

[Article by Witold Gawron: "Playing for Big Stakes"]

[Text] The GDR is among those socialist countries that fairly quickly understood the benefits of comprehensive automation of industrial production. Thus it already has significant experience in organizing its own industrial production of automated equipment and industrial robots and in the design of elastic production systems.

The dynamic growth of microelectronics in the 1970's made it possible to equip industrial enterprises in many countries with elastic production systems, that combine computers and multifunction robots. The GDR thanks to decisions made at the highest state level began shifting industry to elastic automation in the middle of the 1970's beginning by modernizing its machine park.

Exports

GDR specialists point out that the necessity of modernizing the technical base of industry has several causes. Among them are the significant percentage of the GDR's national income that comes from foreign trade which forces it to maintain competitive products on international markets by introducing innovative production methods and products. Elastic automation meets such technical advancement half way, for it makes production of relatively cheap products possible. It also allows relatively quick reaction to signals from consumers and markets.

Elastic production systems revolutionized production methods and are spreading with lightening speed over the whole world. Their technical elements are numerically controlled machines and equipment, industrial robots, equipped with measurement and control instruments and computer programs developed specially for particular industrial branches.

The basis of such elastic automation of production has existed in the GDR since the beginning of the 1970's. The industrial machine park has been largely replaced. At present one-third of the park is less than 5 years old, and 60 percent of the industrial machinery and equipment is less than 10 years old, while 20 percent of the machinery and equipment has been specially

adapted for elastic production systems.

An analysis of the effects of implementing elastic production systems conducted by the GDR specialists showed that this process leads to various, frequently deep changes in the country's economic structure. The list includes reorientation of the product assortment, changes in jobs, rationalization of management, accelerated production cycles, rationalization of labor, increased product quality, and more rapid innovation. Some of these changes, for example rationalization of labor, create new, difficult problems. In the GDR, for example, automated production by more than 43,000 automated machines and robots operation in industry liquidated about 1 million jobs. Nevertheless, gains from automation make retraining displaced workers profitable.

Results

The extensive, systematic modernization of production methods in the GDR which has been underway since the middle of the 1970's has produced concrete results. In many branches of industry production uses elastic processing systems. These are comprehensive production units of automated machines, robots, and computers controlling the entire technological process. The first such system, Prisma 2, was introduced in the GDR in 1972 in the machine industry. Since then much progress has been made. At present the GDR produces a rich assortment of instruments for elastic production systems for many branches of industry. They are used in many systems on various scales of production.

The advances made by the GDR designers and engineers have come in the area of design and production of the assisting computers. In the metal industry CAD/CAM systems have been introduced into selected branches. The experts calculate that they will save 20 to 25 percent of time in the production cycle, 25 to 75 percent of the labor, and about 60 percent of the costs of production. The users of CAD/CAM systems report that on average they are 2.5 to 3 times faster than older production methods; the process of preparing production and implementing production technology is also much shorter, while the design process is much simpler, which permits flexible reaction to the market.

A new development period of so-called elastic automation in the GDR began at the beginning of the 1980's when the decision was made to accelerate the introduction of industrial robots. In 1984, more than 43,000 robots were in use in industry in the GDR. Production of the main types of multifunction robots was also begun.

Consequences

The GDR specialists report that elastic automation alters the content, demands, and conditions of work. The machine's control of information brings the content of work out into the light of day. New specialties and skills appear based on computer technology. An increasing number of workers are servicing machines and equipment equipped with computers that require increased knowledge by the employees. On the other hand, the abilities of

elastic production systems are so great and varied that machines perform functions previously done by people.

Elastic automation, GDR engineers report, requires new qualifications. Training programs have begun to prepare personnel for working with the new technologies. It is worth noting that 83 percent of the worker in the GDR had completed vocational education in their occupation by 1983. Temporary and long-term programs have also begun. The first at the level of secondary vocational education, and the second at the level of higher technical training.

Directions of Development

The development program for industrial automation and the introduction of elastic production methods is precisely controlled. It is worth mentioning some of the directions to become aware of the advancement the GDR has made in this area. The most immediate goal is to shift to automation in increasingly complex, sophisticated technological production processes; raise the quality of the automated systems and reduce the costs of the production of microelectronic elements; raise the level of the data coding, preparatory data, and their processing and storage; and improve the communication between man and machine.

The GDR development program in elastic industrial production automation anticipates a dual strategy.

The first strategy is calculated to improve the existing elements of single-celled automation and elastic automation, including modular systems capable of adapting to work in more complex systems. This includes new applications (assembly lines, measurement and control functions), the introduction of a second generation of robots, the application of integrated elastic units and production systems, improvements in elastic transportation systems, new microelectronics production systems for integrated circuits.

The second strategy aims at the development of comprehensive systems capable of introducing integrated automated production technology, combining single and multi-function automation. It includes the development of elastic production systems reducing employment and of broader use of CAD/CAM systems in the comprehensive preparation and control of production.

GDR engineers a playing for big stakes. The strategic problem before them consists of the following uncertainty: what is the future configuration of elastic production systems? As yet there is no answer to this question, for the entire process of industrial automation is being created. However, it appears that completely automated factories are only one direction of automation because of the high capital costs and the slight flexibility of reactions of such a plant to change market conditions. Elastic automated production modules that can work with other modules and allow considerable flexibility in the industrial profile are another probable direction of development. Several such modules have been developed in the GDR.

The future of elastic production systems falls within these areas in which obviously many intermediate developments can occur.

The uncertain and generally unknown development trends in industrial automation have led the GDR to pay much attention to analyzing possible chains of events. Research institutes, technical support units, and planning offices are conducting comprehensive conceptual work that should produce optimal solutions for the GDR's situation.

13021
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PRC TO DEVELOP FIGHTER PLANE WITH EMBRAER

PY061655 Rio de Janeiro O GLOBO in Portuguese 27 Mar 87 p 29

[Text] Brasilia -- The PRC wishes to build a supersonic fighter plane in conjunction with Embraer [Brazilian Aeronautics Company]. The airplane will feature advanced technology, nonconventional materials in its structure, and be comparable to the European and American aircraft designed for the coming decade. The project, construction, and marketing will be handled jointly by the two countries.

The China Aircraft Import and Export Corporation Committee, currently visiting Rio de Janeiro, will go next week to Sao Jose dos Campos to make the initial contacts with Embraer. The Chinese committee, headed by Sun Zhaoquig, president of Catic [not further identified], will negotiate the purchase of Xingu executive airplanes. These Xingu planes will be used to train pilots of the Chinese state transportation company.

The Chinese committee is currently meeting with Brazilian Air Force [FAB] officers. These meetings were commissioned by Minister Octavio Julio Moreira Lima to evaluate the most advanced craft, the F-7 Airguard fighter plane, exported by Catic.

An FAB delegation flew this plane in the PRC last December, and requested the inclusion of additional equipment to make it more adequate for Brazilian operational conditions. These modifications include a landing system for poor visibility conditions and an intertial landing system. The Catic Committee brought the plans of a modified F-7 M Airguard to show it to the FAB committee.

A sales package is ready. It includes GE locomotives, Santa Matilde urban electric trains and wagons, Terex all-terrain trucks, elebra [nor further identified] radar for airports, Digital Technical Systems [Sistema Tecnoco Digitais] industrial computers, and large Muller agricultural tractors.

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